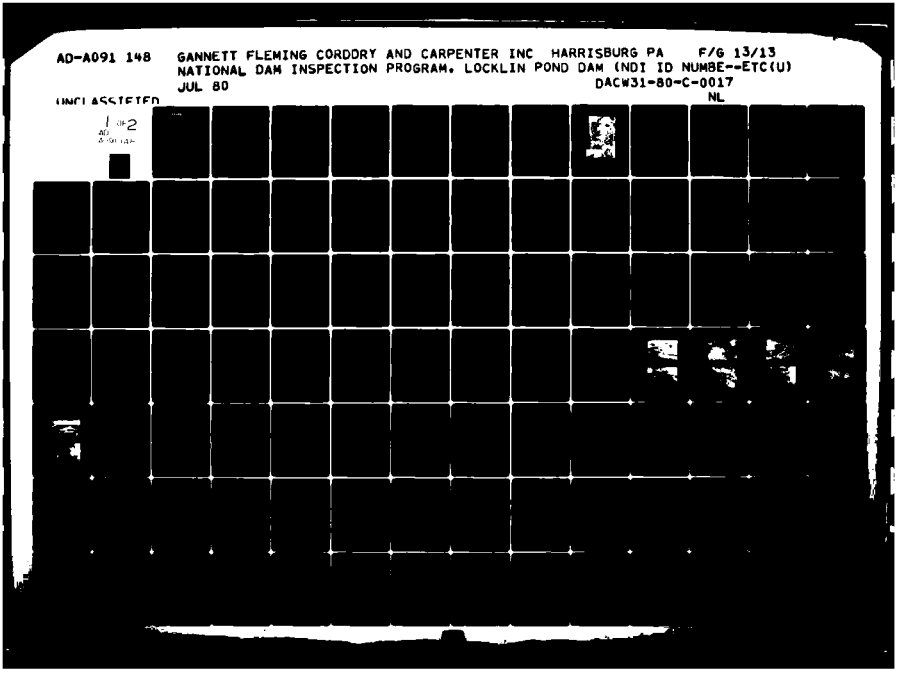
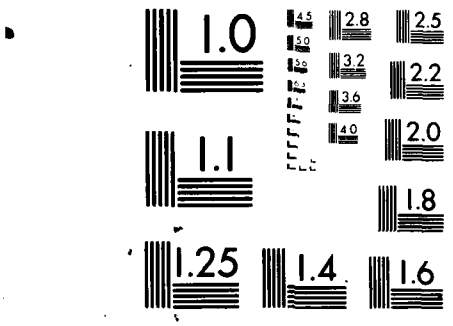
AD-A091 148 GANNETT FLEMING CORDDRY AND CARPENTER INC HARRISBURG PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. LOCKLIN POND DAM (NDI ID NUMBE--ETC(U)
JUL 80 DACW31-80-C-0017
UNCLASSIFIED NL





LEVEL II

DELAWARE RIVER BASIN
LAKEVILLE CREEK, WAYNE COUNTY

PENNSYLVANIA

LOCKLIN POND DAM

NDI ID NO. PA-00139
DER ID NO. 64-31

CLIFTON AND LEWIS LOCKLIN

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Prepared by
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
Harrisburg, Pennsylvania 17105

DACW31-80-C-0017

For
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

JULY 1980

DELAWARE RIVER BASIN

LAKEVILLE CREEK, WAYNE COUNTY

PENNSYLVANIA

LOCKLIN POND DAM

NDI ID No. PA-00139
DER ID No. 64-31

CLIFTON AND LEWIS LOCKLIN

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

Locklin Pond Dam (NDI ID Number PA-00139, DER ID Number 64-31), ~~Clifton and Lewis Locklin~~, Delaware River Basin, Lakeville Creek, Wayne County, Pennsylvania

Prepared by

GANNETT FLEMING CORDDRY AND ~~CARPENTER, INC.~~
Consulting Engineers
P.O. Box 1963
Harrisburg, Pennsylvania 17105

DACW31-80-C-0017

For

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

JUL 1980

101

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

DELAWARE RIVER BASIN

LAKEVILLE CREEK, WAYNE COUNTY

PENNSYLVANIA

LOCKLIN POND DAM

NDI ID No. PA-00139
DER ID No. 64-31

CLIFTON AND LEWIS LOCKLIN

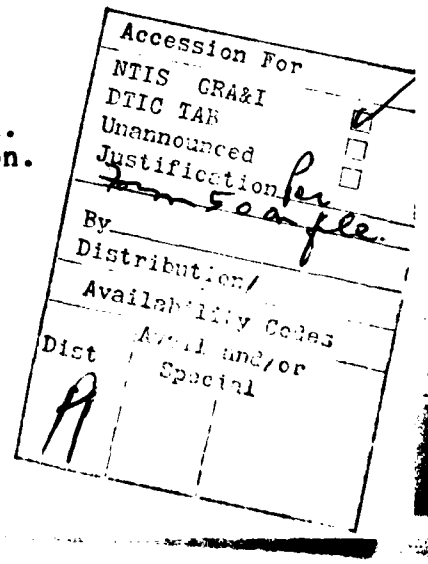
PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1980

CONTENTS

APPENDICES



PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Locklin Pond Dam NDI ID No. PA-00139 DER ID No. 64-31
Size:	Small (13 feet high; 448 acre-ft)
Hazard Classification:	Significant
Owner:	Clifton and Lewis Locklin c/o Mr. Clifton Locklin PO Box 14 Lakeville, PA 18438
State Located:	Pennsylvania
County Located:	Wayne
Stream:	Lakeville Creek
Date of Inspection:	4 June 1980

Based on available records, visual inspection, calculations, and past operational performance, Locklin Pond Dam is judged to be in good condition. Based on the size and hazard classification of the dam, the recommended SDF at the dam varies between the 100-year flood and the 1/2 PMF. Based on the criteria, the selected SDF is the 1/2 PMF. Based on existing conditions, the spillway will pass about 8 percent of the PMF before overtopping of the dam occurs.

No stability problems are evident at the dam. There are no emergency drawdown facilities at the dam. Maintenance at the dam needs to be improved.

The following studies and remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Perform additional studies to more accurately ascertain the spillway capacity required for Locklin Pond Dam as well as the nature and extent of measures required to provide adequate spillway capacity. The study should also address the capacity of the spillway outlet channels. Take appropriate action as required.

(2) Design and construct a suitable means of drawing down the reservoir in case of an emergency. Any pipe that is placed through the embankment should be provided with an upstream closure facility.

(3) Clear trees and debris from the auxiliary spillway crest and maintain the auxiliary spillway such that its full design length is unobstructed.

(4) Remove the tree from the upstream slope.

(5) Repair the eroded areas on the upstream slope and provide suitable erosion protection.

All investigations, studies, designs, and inspection of construction should be performed by a professional engineer experienced in the design and construction of dams. Tree removal should also be under the guidance of a professional engineer.

In addition, the Owner should institute the following operational and maintenance procedures:

(1) Develop a detailed emergency operation and warning system. The dwellings that might be flooded by flow over the auxiliary spillway or around the right end of the dam should be included in the emergency warning system.

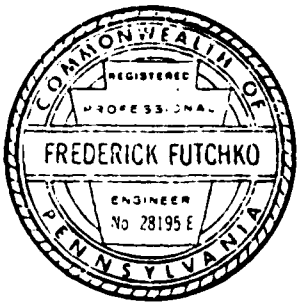
(2) During periods of unusually heavy rains, provide round-the-clock surveillance of the dam.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) Initiate an inspection program at the dam such that the dam is inspected on a regular basis. As presently required by the Commonwealth, the inspection program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary.

(5) Expand the existing maintenance program so that all features of the dam are properly maintained.

Submitted by:



GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

FREDERICK FUTCHKO
Project Manager, Dam Section

Date: 8 August 1980

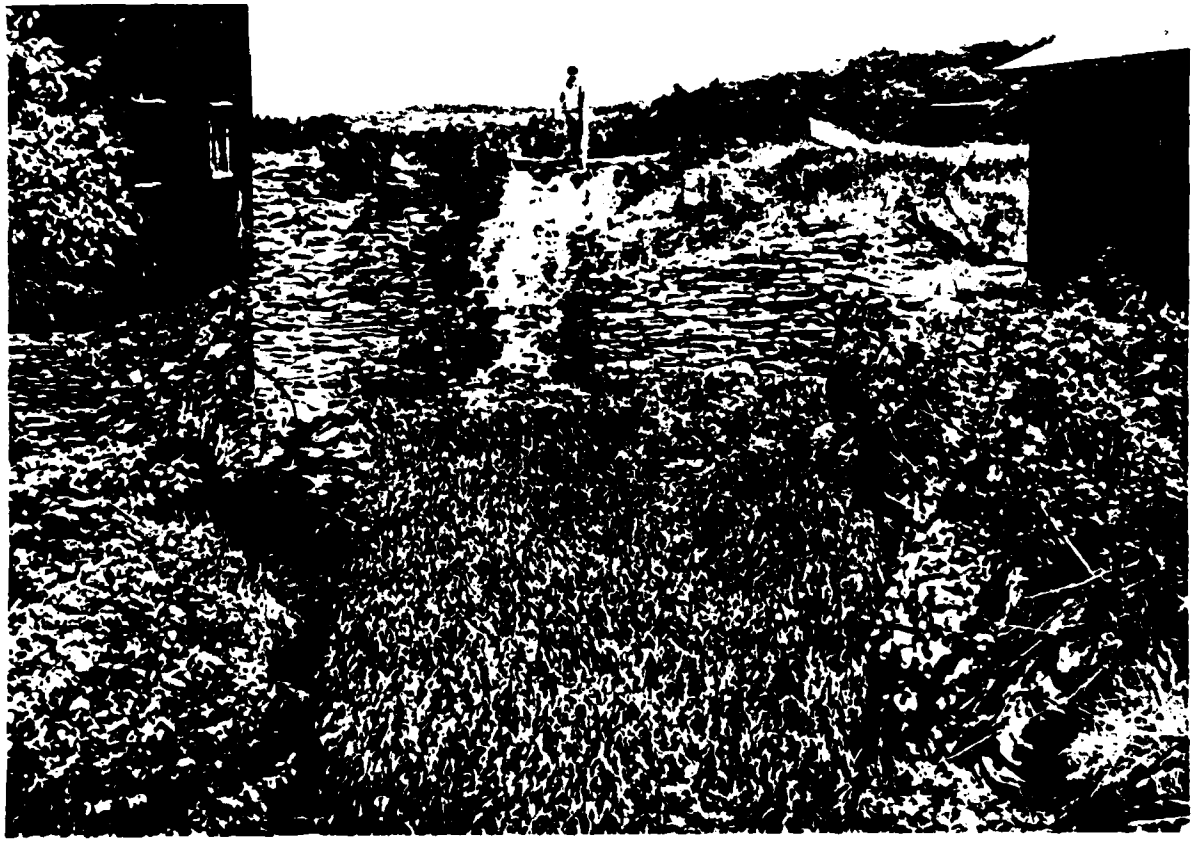
Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 2 Sep 1980

LOCKLIN POND DAM



Overview

DELAWARE RIVER BASIN

LAKEVILLE CREEK, WAYNE COUNTY

PENNSYLVANIA

LOCKLIN POND DAM

NDI ID No. PA-00139
DER ID No. 64-31

CLIFTON AND LEWIS LOCKLIN

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1980

SECTION 1

PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Locklin Pond Dam consists of an embankment of varying cross section, a main spillway, and an auxiliary spillway. The overall length of the embankment, including the main spillway, is 369 feet. The dam is about 13 feet high.

The part of the embankment that extends to the left of the main spillway is bare soil. The upstream slope, which is quite flat, is used as a boat launch area. The downstream slope, which is about 1V on 8H, is used as a parking area. The right end of this part of the embankment slopes down to the main spillway crest.

The main spillway is a dry stone masonry structure with the ends not well-defined. To the right of the main spillway, the embankment extends for about 230 feet. The downstream slope of this part of the dam varies from a vertical mortared-rockfill wall to a nearly-flat earthen slope. The upstream slope is nearly vertical above normal pool along this part of the dam except at the right end, where the slope is nearly flat.

A natural low area extends beyond the right end of the embankment. The left end of the embankment ends at a natural knoll. The auxiliary spillway is located to the left of the knoll. It is an L-shaped side channel spillway with a timber sheet pile crest. The auxiliary spillway crest is at the same elevation as the main spillway crest.

Although both spillway crests are at the same elevation, the left spillway is termed the auxiliary spillway in this Report to differentiate it from the main, or right, spillway. The various features of the dam are shown on the Photographs in Appendix C and on the Plates in Appendix E. A description of the geology is included in Appendix F.

b. Location. Locklin Pond Dam is located on Lakeville Creek in Paupack Township, Wayne County, Pennsylvania. The dam is within the community of Lakeville. Locklin Pond Dam is shown on USGS Quadrangle, Lakeville, Pennsylvania, at latitude N 41° 26' 20" and longitude W 75° 16' 40". A location map is shown on Plate E-1.

c. Size Classification. Small (13 feet high, 448 acre-feet).

d. Hazard Classification. Significant hazard. Downstream conditions indicate that a significant hazard classification is warranted for Locklin Pond Dam (Paragraphs 3.1e and 5.1c (5)).

e. Ownership. Clifton and Lewis Locklin, c/o Mr. Clifton Locklin, PO Box 14, Lakeville, PA 18438.

f. Purpose of Dam. Recreation.

g. Design and Construction History. The present Owner's family acquired the dam in 1889 to operate a mill, which is abandoned but still remains. The Owner does not have any information concerning the early history of the dam.

The Pennsylvania Water Supply Commission (PWSC) prepared a report on the dam in 1917. They did not discover any data concerning the early history of the dam. In 1917, the dam was described as being constructed of stone and earth fill. At this time a 150-foot long embankment existed across the site of the present auxiliary spillway. In 1917, the spillway was located at the site of the 150-foot long embankment.

Approximately in 1929, the dry stone masonry face of the dam was "reinforced by a concrete facing" over a length of 180 feet. The exact limits are uncertain. Apparently at that time, the sluiceway to the mill, which is at the site of the present main spillway, was modified slightly to act as a spillway.

In 1931, the Pennsylvania Department of Highways (presently PennDOT) planned to relocate the road that extends immediately downstream from the axis of the dam. The relocation required that the left embankment be covered by the roadway fill. As part of the relocation, the present auxiliary spillway was to be built. These modifications were completed in late 1931 or early 1932 and are referred to hereafter as the 1932 modifications.

The dam overtopped during Tropical Storm Diane in 1955. A 12-foot long by 6-inch deep section of the embankment to the left of the main spillway washed out. No resulting damage downstream was reported. The damage was repaired shortly thereafter.

Other modifications, including repairs to the upstream slope and filling downstream of the original embankment, have been accomplished but the dates of these modifications are unknown.

h. Normal Operational Procedure. The pool is maintained at the spillway crest level with excess inflow

discharging over the spillways. There are no emergency drawdown facilities. Spillway discharge flows downstream in Lakeville Creek to the confluence with Purdy Creek, which flows into Lake Wallenpaupack.

1.3 Pertinent Data (existing conditions).

a.	Drainage Area. (square miles)	4.9
b.	Discharge at Damsite. (cfs.)	
	Maximum known flood at damsite	Unknown.
	Outlet works at maximum pool elevation	None.
	Spillway capacity at maximum pool elevation	
	Main	90
	Auxiliary	200
	Total	290
c.	Elevation. (feet above msl.)	
	Top of dam	1259.0 (see Section 5)
	Maximum pool	1259.0
	Normal pool (spillway crests)	1258.1
	Upstream invert outlet works	None.
	Downstream invert outlet works	None.
	Streambed at toe of dam	1246.2
d.	Reservoir Length. (miles)	
	Normal pool	1.00
	Maximum pool	1.02
e.	Storage. (acre-feet)	
	Normal pool	365
	Maximum pool	448
f.	Reservoir Surface. (acres)	
	Normal pool	91
	Maximum pool	93
g.	Dam.	
	Type	Unknown (see Section 6).
	Length (feet - including main spillway)	369

g.	Dam. (cont'd.) Height (feet)	13
	Topwidth (feet)	Varies, see Appendix B
	Sides Slopes Upstream Downstream	 Varies. Varies.
	Zoning	Unknown.
	Cut-off	Unknown.
	Grout Curtain	None.
h.	Diversion and Regulating Tunnel.	None.
i.	Spillway. Type Main (at right) Auxiliary (at left)	 Broad-crested dry stone masonry weir. L-shaped side channel spillway with timber sheet pile crest.
	Length of Weir (feet) Main	 50.0 (see Section 5)
	Auxiliary (existing) (design)	 83.0 98.8
	Crest Elevation Main Auxiliary	 1258.1 1258.1
	Upstream Channel Main Auxiliary	 Reservoir. Reservoir.

i.	Spillway. (cont'd.) Downstream Channel Main	Dry stone masonry apron.
	Auxiliary	Grouted stone apron.
j.	Regulating Outlets.	None.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. No design data are available for the original dam or the 1929 modifications. The only design data available for the 1932 modifications are the design drawings.

b. Design Features. The project is described in Paragraph 1.2a. The various features of the dam are shown on the Photographs in Appendix C and on the Plates in Appendix E.

c. Design Considerations. There is insufficient data to assess the design.

2.2 Construction.

a. Data Available. No construction data are available, except for reported changes to the 1932 modifications.

b. Construction Considerations. There are insufficient data to assess the construction.

2.3 Operation. There are no formal records of operation. A record of operation does exist in the form of inspection reports prepared by the Commonwealth between 1930 and 1965. The previous inspections are discussed in Sections 5 and 6.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dams and Waterway Management, Department of Environmental Resources, Commonwealth of Pennsylvania (PennDER). The Owner made himself available for information during the visual inspection.

b. Adequacy. The type and amount of available design data and other engineering data are very limited, and the assessment must be based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam is good. Some deficiencies were observed as noted below. A sketch of the dam with the locations of deficiencies is presented on Exhibit B-1 in Appendix B. Survey information acquired for this Report is summarized in Appendix B. Datum for the survey was taken at the top of the downstream wingwall of the highway bridge downstream from the main spillway, Elevation 1252.22. On the day of the inspection, the pool was at the spillway crest level.

b. Embankment. The embankment is in generally good condition. To the left of the main spillway, the embankment is covered with a shale fill; no deficiencies were observed in this area (Photograph A). To the right of the main spillway, the embankment is covered with grass, except where the downstream slope is a vertical wall. The top is well maintained (Photograph B). The upstream slope is near-vertical along most of its length. There is evidence of erosion along most of the slope. The most severe erosion has occurred near the right end; here the erosion encroaches 3 feet into the top over a 3-foot long reach (Photograph D). One shrub is growing on the upstream slope. Near the right end, a 20-inch diameter tree is growing on the embankment.

The earthen section of the downstream slope is covered by tall grass (Photograph C). The Owner explained that the steepness of the slope made it difficult to mow. A section of the downstream slope is a vertical wall. The concrete facing of the wall is deteriorating. The facing appears to be quite thin. Beyond the right end of the embankment, there is a natural low area. No seepage was observed at the dam.

The survey performed for this inspection reveals that the top of the dam is uneven. Results are shown on Plate E-2 and on the profile in Appendix B.

c. Appurtenant Structures. Physically, the main spillway is in good condition (Photograph E). The dry

stone masonry is intact and is well-placed. The ends of the spillway crest are indistinct and the right end slopes gently upward to the embankment. The left end, which is the lowest part of the crest, terminates at the top of the embankment. A concrete or concrete-faced wall extends through the spillway structure; the top of it is visible at some locations. Except at the lowest point, the spillway crest is covered with grass.

The main spillway channel has a dry stone masonry wall on the left (Photograph F). The right side of the channel is the abandoned mill that used to be operated by the dam. Downstream of the mill is a dry masonry wall and then a natural slope. The bottom of the channel is earthen and most of it is covered with tall grass. At the end of the channel is a bridge. PA Route 590 (PA-590) crosses the bridge.

The auxiliary spillway is covered with tall, thick grass (Photograph G). The weir is L-shaped. The most downstream part of the weir has large soil deposits and a tree adjacent to it (Photograph H). There is debris lying on other parts of the weir. The crest itself is timber sheet pile; it is in good condition except some horizontal boards are loose. Most of the exit channel has tall, thick grass growing in it. The right side-slope of the channel, which is the only unobscured part of the channel, is grouted stone; it is in good condition. At the end of the channel is a PA-590 bridge.

d. Reservoir Area. At the embankment to the right of the main spillway, there are the remains of waterlogged logs and old abandoned rowboats. These apparently have been placed to act as a breakwater and reduce the erosive action of waves. The watershed itself is mostly wooded, with negligible rural development. There are 3 dams in the watershed, as described in Appendix D.

e. Downstream Conditions. Three structures are shown downstream of the dam on Plate E-2. The two to the right of the main spillway channel are abandoned. The one to the left of the main spillway channel is the Owner's place of business. No persons live within. Immediately downstream from the PA-590 bridge is one low-lying dwelling that would be flooded if the dam were to fail.

Downstream from the embankment to the right of the main spillway are 2 dwellings that might have their basements flooded by a failure of the embankment. These

two structures, as well as another that is further to the right, would also probably be flooded to a shallow depth by flow occurring around the right end of the dam. It appeared that flow occurring at the right end of the dam would not flow directly to Lakeville Creek but would flow towards another stream that is near the right abutment. The Owner stated that during Tropical Storm Diane just the opposite occurred and water at the other creek overtopped the banks and flowed parallel to PA-590, crossed the road, and flooded the dwelling downstream from PA-590. He confirmed that flow occurred around the right end of the dam during some floods.

Just downstream from the bridge that crosses the auxiliary spillway channel, an unpaved road crosses the channel. The top of the road is 4.3 feet below the crest of the auxiliary spillway. A 6-foot diameter Corrugated Metal Pipe (CMP) extends beneath the unpaved road. At the left end of the crossing, a low-lying dwelling is at the channel bank.

Downstream of the structures noted above, the stream flows for 0.8 mile along an uninhabited reach to Lake Wallenpaupack. A small bridge crosses the stream at the confluence with Lake Wallenpaupack.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at the level of the spillway crests with excess discharge flowing downstream. There is no outlet works at the dam.

4.2 Maintenance of Dam. Mr. Clifton Locklin lives at the left abutment of the embankment and conducts a boat rental business at the dam. He does not live at the dam during the winter. The top of the embankment is mowed frequently. Mr. Locklin reported that he fills the upstream slope when erosion becomes severe. Formal inspections of the dam are not made.

4.3 Maintenance of Operating Facilities. There are no operating facilities to maintain.

4.4 Warning Systems in Effect. There is no emergency operation and warning system.

4.5 Evaluation of Operational Adequacy. The maintenance of the upstream slope and the auxiliary spillway needs to be improved. The maintenance of the other features is adequate. The daily inspection program for the dam is good, except during the winter. Formal inspections are necessary to detect potentially hazardous conditions at the dam. A detailed emergency operation and warning system is necessary to reduce the risk of dam failure should adverse conditions develop and to prevent loss of life should the dam fail.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The only design data available are for the 1932 modification to the dam, for which the PWSC analyzed the spillway capacity. Using a design head of 2.0 feet, the PWSC estimated the auxiliary spillway capacity at 1,000 CFS. The PWSC then wrote a letter to the Owner requesting that he provide an additional main spillway capacity of 600 cfs. The Owner apparently complied by raising certain sections of the embankment. Near the completion of the 1932 modifications, the Owner objected to the as-constructed elevation of the auxiliary spillway weir and the weir was lowered. It is unclear whether the weir was constructed above its design elevation, whether the design elevation of the embankment was in error, or whether the as-constructed elevation did not suit the Owner. The PWSC selection of a 2.0 design head was apparently based on what they thought could be made available and not on any design data. Even with a 2.0-foot head, the PWSC estimate of 1,000 CFS for the auxiliary spillway seems high.

The drainage area of 4.9 square miles that is used in this Report is based on recent USGS mapping. The previous estimate of 4.5 square miles dates from about 1917, when less accurate mapping was available.

b. Experience Data. The dam was overtopped in 1955 during Tropical Storm Diane when a 12-foot long by 6-inch deep section of the embankment washed out. There is insufficient data to estimate the flow for this storm.

c. Visual Observations.

(1) General. The visual inspection of Locklin Pond Dam, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.

(2) Embankment. There is no readily discernable top elevation. The unprotected top of the embankment slopes down to the main spillway crest. For the purposes of this Report, Elevation 1259.0 is judged to

be the top of dam elevation. This elevation is 0.9 foot above the main spillway crest and 0.1 foot below the natural low area at the right end of the dam. Other observations at the embankment are evaluated in Section 6.

(3) Appurtenant Structures. At the main spillway, large flows would not totally be contained within the main spillway channel but would flow over the embankment to the left of the main spillway. It is not felt that the effects of this would become significant until the pool was above the top of dam elevation noted above. The main spillway channel is in good condition.

The auxiliary spillway weir is significantly shorter than the design drawings indicate. The tree at the downstream end is apparently growing on the weir, and soil has collected around the tree. This, and other debris along the weir, reduces the discharge capacity. The grass growing in the auxiliary spillway channel is sufficiently low that it will have negligible effect on the discharge capacity. The grass obscures the auxiliary spillway and makes visual inspection difficult.

With the existing top elevation, it is estimated that the hydraulic capacity of both the main and auxiliary spillway channels as well as the hydraulic capacity of the bridge openings is adequate. This would not necessarily be true if the spillway capacity were increased.

Because there is no outlet works, there is no means to draw down the pool in case of an emergency.

(4) Reservoir Area. There are 3 impoundments within the watershed, as noted in Appendix D. Two of these (Herrmann Dam and Lakeville Club Dam) are included in the analysis described hereafter because of their hydrologic effects. Their storage is quite small, but their combined failures could have a significant effect on Locklin Pond Dam. Lake Paupacken Dam has a much larger impoundment and its failure would have significant effects at Locklin Pond Dam. The Owner of Locklin Pond Dam reported that, immediately after Tropical Storm Diane when Locklin Pond had returned to near normal pool elevation, water was flowing about 1 foot deep over Lake Paupacken Dam. He also reported that, during high pool conditions at Lake Paupacken, water flows out of the upper end of Lake Paupacken and into another watershed. USGS mapping

indicates that this is possible. Ready access to the area could not be gained and the inspection team could not confirm this condition. The effects of water flowing out of the upper end of Lake Paupacken Dam are not included in the analysis described hereafter. Other than the dams, development in the watershed is negligible.

(5) Downstream Conditions. A failure of the dam would flood 1 dwelling and cause basement flooding at two others. This indicates that a significant hazard classification is warranted for Locklin Pond Dam. A failure of Locklin Pond Dam would have no effect on Lake Wallenpaupack. However, irrespective of a failure of Locklin Pond Dam, one dwelling would be flooded to a shallow depth by substantial flow over the auxiliary spillway, and 3 others could be flooded to a shallow depth by flow around the right end of the dam.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (Small) and hazard potential (Significant) of Locklin Pond Dam is between the 100-year flood and one-half of the Probable Maximum Flood (PMF). Because of the possibility of loss of life downstream, the 1/2 PMF is selected as the SDF for Locklin Pond Dam. The watershed was modeled with the HEC-1DB computer program. A description of the model is included in Appendix D. The assessment of hydrology and hydraulics is based on existing conditions, and the effects of future development are not considered.

(2) Summary of Results. Pertinent results are tabulated at the end of Appendix D. The analysis reveals that Locklin Pond Dam can pass about 8 percent of the PMF before overtopping of the dam occurs. The dam is rated at the previously noted top elevation. As part of this study, it was also found that Lake Paupacken Dam, located upstream from Locklin Pond Dam, will pass 18 percent of its component of the PMF before being overtopped. In addition, both the other upstream dams, Lakeview Club Dam and Herrmann Dam, will pass less than 5 percent of their components of the PMF.

(3) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix D. Because Locklin Pond Dam cannot pass its SDF, the spillway capacity of Locklin Pond Dam is rated as inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Locklin Pond Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for the various features.

(2) Embankment. The growth of the tree on the upstream slope is a minor hazard at present. Root systems of large trees can loosen embankment material, displace slope protection, and create paths along which seepage and piping (internal erosion) might occur. Because of the wide topwidth and low height of the embankment near the tree, the hazard is only considered to be minor. The other small shrub on the upstream slope is no hazard at present, although further growth is undesirable. Although the erosion on the upstream slope is significant, it is not an immediate hazard because of the wide topwidth. Further erosion would soon become a hazard. The deterioration of the mortar (or concrete) in the wall that is at the downstream side of the embankment is a maintenance deficiency.

(3) Appurtenant Structures. No structural deficiencies were observed at the main spillway. The loosening of the horizontal boards at the auxiliary spillway weir are of no concern. The nature of the auxiliary spillway is such that a structural failure could not occur.

b. Design and Construction Data. No stability analyses are available for the embankment or the main spillway weir. There are no definitive data concerning the composition of the embankment. There are no data concerning the foundation conditions. By piecing together data in the files, verbal reports from the Owner, and observations during the visual inspection, it can be assumed that Locklin Pond Dam embankment is a dry stone masonry dam with upstream earthfill. Either the downstream face of the dry masonry was later mortared or a

concrete wall was constructed along the downstream face. To the left of the main spillway, the downstream slope of this structure was filled to provide a parking area. Apparently, the main spillway is similar except that, instead of earthfill, the downstream slope is hand-placed stone. The PWSC report of 1917 indicates that the upstream slope of the embankment is "very flat."

c. Operating Records. There are no formal records of operation. According to available records, no slope stability problems have occurred over the operational history of the structure. Previous inspections note some seepage to the right of the main spillway; none was observed on the day of the inspection.

Judging by existing conditions, there is no concern for the stability of Locklin Pond Dam.

d. Post-construction Changes. Post-construction changes are described in Paragraph 1.2g. The changes have been assessed with the dam.

e. Seismic Stability. Locklin Pond Dam is located in Seismic Zone 1. Earthquake loadings are not considered to be significant for small dams located in Seismic Zone 1 when there are no readily apparent stability problems. Since there are no readily apparent stability problems, the ability of the embankment to withstand an earthquake is assumed to be adequate.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on available records, visual inspection, calculations, and past operational performance, Locklin Pond Dam is judged to be in good condition. Based on the size and hazard classification of the dam, the recommended SDF at the dam varies between the 100-year flood and the 1/2 PMF. Based on the criteria, the selected SDF is the 1/2 PMF. Based on existing conditions, the spillway will pass about 8 percent of the PMF before overtopping of the dam occurs.

(2) No stability problems are evident at the dam.

(3) There are no emergency drawdown facilities at the dam.

(4) Maintenance at the dam needs to be improved.

(5) A summary of the features and observed deficiencies is listed below:

Feature and Location	Observed Deficiency
Embankment:	Large tree, shrub, and erosion at upstream slope; deteriorated mortar or concrete at wall along downstream slope.
Auxiliary Spillway:	Tree and debris on weir.

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented immediately.

d. Necessity for Further Investigations. In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations by the Owner will be required.

7.2 Recommendations and Remedial Measures.

a. The following studies and remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Perform additional studies to more accurately ascertain the spillway capacity required for Locklin Pond Dam as well as the nature and extent of measures required to provide adequate spillway capacity. The study should also address the capacity of the spillway outlet channels. Take appropriate action as required.

(2) Design and construct a suitable means of drawing down the reservoir in case of an emergency. Any pipe that is placed through the embankment should be provided with an upstream closure facility.

(3) Clear trees and debris from the auxiliary spillway crest and maintain the auxiliary spillway such that its full design length is unobstructed.

(4) Remove the tree from the upstream slope.

(5) Repair the eroded areas on the upstream slope and provide suitable erosion protection.

All investigations, studies, designs, and inspection of construction should be performed by a professional engineer experienced in the design and construction of dams. Tree removal should also be under the guidance of a professional engineer.

b. In addition, the Owner should institute the following operational and maintenance procedures:

(1) Develop a detailed emergency operation and warning system. The dwellings that might be flooded by flow over the auxiliary spillway or around the right end of the dam should be included in the emergency warning system.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of the dam.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) Initiate an inspection program at the dam such that the dam is inspected on a regular basis. As presently required by the Commonwealth, the inspection program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary.

(5) Expand the existing maintenance program so that all features of the dam are properly maintained.

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: LOCKLIN POND

NDI ID NO.: PA-00 DER ID NO.: _____

Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	DESIGN DRAWINGS ONLY FOR AUXILIARY SPILLWAY SEE PLATES
REGIONAL VICINITY MAP	SEE PLATE E-1
CONSTRUCTION HISTORY	UNKNOWN
TYPICAL SECTIONS OF DAM	NONE
OUTLETS: Plan Details Constraints Discharge Ratings	NO OUTLETS AT SITE

A-1

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NONE
DESIGN REPORTS	NONE
GEOLOGY REPORTS	NONE
DESIGN COMPUTATIONS: Hydrology and Hydraulics (H&H) Dam Stability Seepage Studies	NONE EXCEPT SOME INFORMAL H&H COMPUTATIONS by PWSC
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	NONE
POSTCONSTRUCTION SURVEYS OF DAM	NONE EXCEPT AS SHOWN ON PLATE E-3

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	UNKNOWN
MONITORING SYSTEMS	NONE
MODIFICATIONS	AUXILIARY SPILLWAY ADDED 1932 by HIGHWAY DEPARTMENT. CONCRETE "CORE-WALL" ADDED, DATE UNCERTAIN
HIGH POOL RECORDS	TROPICAL STORM DIANE - 1955
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	1917 - PWSC REPORT
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	6" OF TOP OF EMBANKMENT TO LEFT OF MAIN SPILLWAY WASHED OUT DURING TROPICAL STORM DIANE.

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	NONE
SPILLWAY: Plan Sections Details	AUXILIARY SPILLWAY ONLY SEE PLATES
OPERATING EQUIPMENT: Plans Details	NONE AT SITE
PREVIOUS INSPECTIONS Dates Deficiencies	1930 - CONSIDERABLE LEAKAGE UNDER THE CENTRAL AND HIGHEST PORTION OF THE DAM. "ABOUT A YEAR AGO THE DOWNSTREAM WALL OF THE RIGHT END OVER A LENGTH OF 180 FEET WAS REINFORCED BY A CONCRETE FACING." 1931 (MAY) - NOTES CONCRETE FACING PER 1930. 1931 (AUGUST) - NOTES PROPOSED HIGHWAY CHANGES
(CONTINUED)	1931 (November) - NOTES CHANGES IN HIGHWAY CONSTRUCTION AT AUXILIARY SPILLWAY

ITEM	REMARKS
PREVIOUS INSPECTIONS (CONTINUED)	1932 (JUNE) TOP OF DAM MAY HAVE BEEN RAISED SLIGHTLY AS MAY HAVE BEEN THE MAIN SPILLWAY CREST.
	1934 - NOTES NO CHANGES YET TO ABUTMENTS OF MAIN SPILLWAY AS REQUESTED BY PWSC. CONCRETE FACING ALONG WALL AT RIGHT END IS BADLY SPALLED;
	THERE IS GENERAL SEEPAGE ALONG THIS WALL WITH A SMALL STREAM ABOUT MIDWAY. 1937 - LEAKS IN "SPILLWAY WALL", WITH WATER FLOWING BEHIND WALL SEEPAGE
	AT WALL TO RIGHT OF MAIN SPILLWAY. THERE IS A SMALL SLIDE IN THE WALL TO THE LEFT OF THE MAIN SPILLWAY.
	1938 - PER 1937 1948 - TOP LOW AND UNEVEN, TREES AND BRUSH, SEEPAGE ALONG TOE TO RIGHT OF MAIN SPILLWAY LEFT ABUTMENT OF MAIN SPILLWAY NEEDS REPAIR.
CONTINUED	1952 - SEEPAGE ALONG TOE, WATER NEAR TOP OF DAM. POOR APPEARANCE. 1965 - POOR APPEARANCE. DEBRIS AT BOTH SPILLWAYS

A-5

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: LOCKLIN POND County: WAYNE State: PENNSYLVANIA

NDI ID No.: PA-00139 DER ID No.: 64-31

Type of Dam: EARTHFILL AND ROCKFILL Hazard Category: SIGNIFICANT

Date(s) Inspection: 4 JUNE 1980 Weather: PARTLY SUNNY & WINDY Temperature: 60's °F

SOIL CONDITIONS: MOIST

Pool Elevation at Time of Inspection: 1258.1 msl/Tailwater at Time of Inspection: 1246.2 msl

Inspection Personnel:

C. LOCKLIN (OWNER) D. EBERSOLE (GFCC)

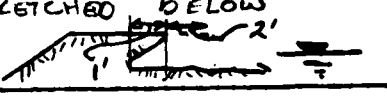
J. CHERNESKY (PENN DER)

D. WILSON (GFCC)

A. WHITMAN (GFCC) Recorder

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	UPSTREAM SLOPE TO RIGHT OF MAIN SPILLWAY - NEAR VERTICAL WITH ERODED AREAS	LARGEST ERODED AREA NEAR RIGHT END, AS SKETCHED BELOW 
CREST ALIGNMENT: Vertical Horizontal	HORIZONTAL - OK VERTICAL - SEE SURVEY DATA FOLLOWING INSPECTION FORMS.	
RIPRAP FAILURES	NONE	SEE EROSION LOGS, DEBRIS, AND SUNKEN ROWBOATS ACT AS "BREAKWATER" ALONG UPSTREAM SLOPE.

B-2

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	OK	
ANY NOTICEABLE SEEPAGE	NONE	
STAFF GAGE AND RECORDER	NONE	
DRAINS	NONE	
VEGETATION	LONG GRASS ON DOWNSTREAM SLOPE TO RIGHT OF MAIN SPILLWAY	20" DIA. TREE ON UPSTREAM SLOPE NEAR RIGHT END. MINOR BRUSH ON UPSTREAM SLOPE.

B 1 W

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	NONE AT SITE	
INTAKE STRUCTURE		
OUTLET STRUCTURE		
OUTLET CHANNEL		
EMERGENCY GATE	NONE AT SITE	

MAIN
~~UNGATED~~ SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
~~CONCRETE~~ WEIR	DRY STONE MASONRY (RIPRAP) UNEVEN CREST - SEE SURVEY DATA	LEFT END IS EARTH WITH GRASS COVER.
APPROACH CHANNEL	RESERVOIR	
DISCHARGE CHANNEL	VERTICAL DRY STONE MASONRY WALLS AT EARTHEN CHANNEL	
BRIDGE AND PIERS	NONE (PLANK ACROSS SPILLWAY)	

B-5

AUXILIARY
~~GATED~~ SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
~~CONCRETE~~ SILL	L-shaped in plan timber sheet pile some battens loose	Downstream end has tree growing in it. Soil covers crest near downstream end. Debris at weir.
APPROACH CHANNEL	Reservoir	
DISCHARGE CHANNEL	Thick but low vegetation growing in most of channel.	Right side is grouted stone. Mortar is slightly deteriorated.
BRIDGE AND PIERS	Roadway bridge downstream - good condition.	
GATES AND OPERATION EQUIPMENT	None	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE AT SITE	
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER	NONE AT SITE	

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	CLEAR OF DEBRIS. BRIDGE OPENINGS AS SHOWN ON PLATES.	
SLOPES	Bedslope MODERATELY STEEP. Overbanks RELATIVELY FLAT.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	1 dwelling THAT WOULD be FLOODED TO A SIGNIFICANT depth by FAILURE OF The dAm	3 dwellings THAT MIGHT possibly have bASEMENT FLOODING FROM A FAILURE NEAR The RIGHT END OF dAm. These 3 dwellings WOULD ALSO
(CONTINUED)	1 dwelling THAT WOULD be FLOODED by AUXILIARY SPILLWAY FLOW (FAILURE OF AUXILIARY SPILLWAY NOT CONSIDERED POSSIBLE)	be FLOODED by FLOW OVER THE NATURAL LOW AREA AT The RIGHT END.

B-8

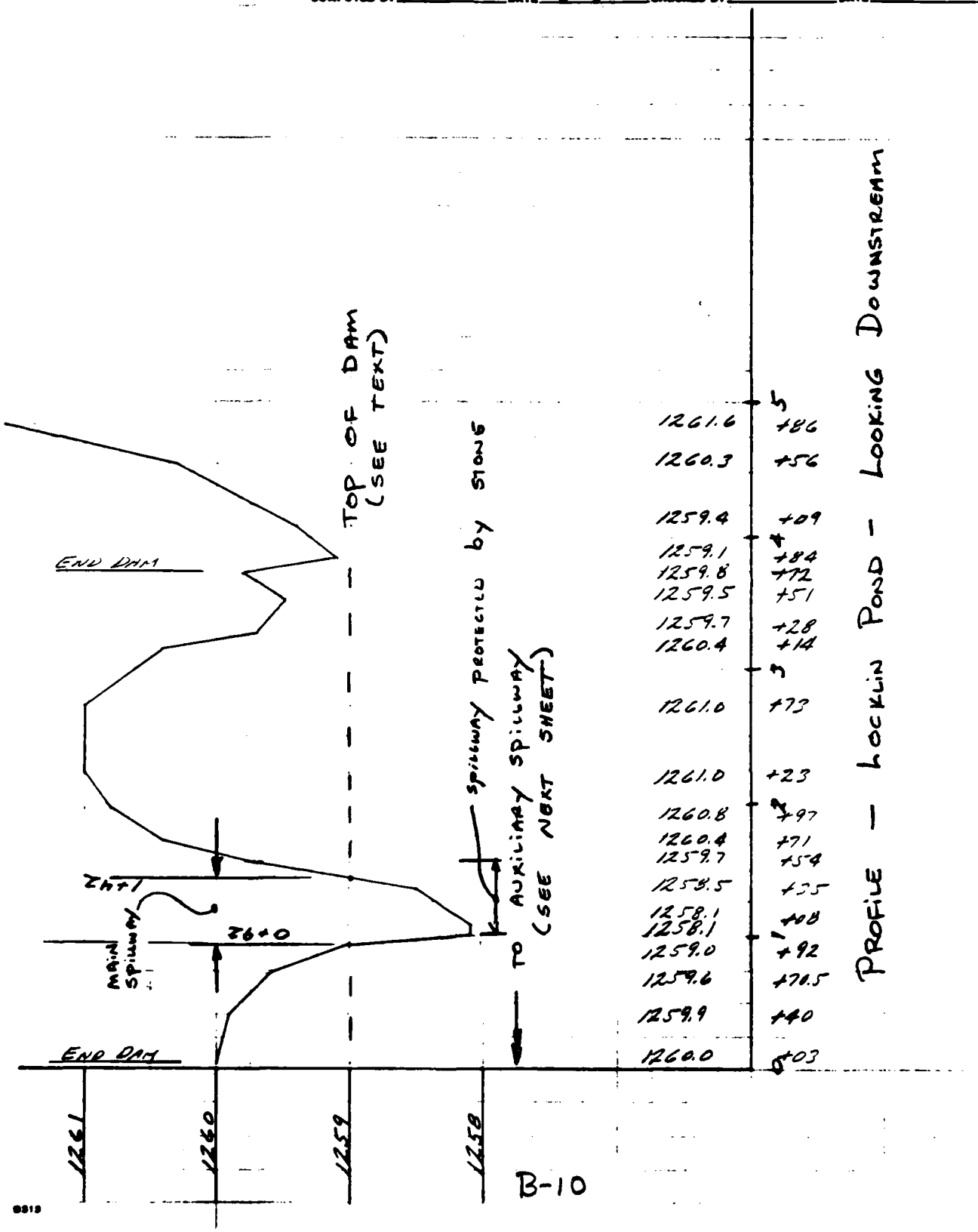
RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	FAIRLY MILD	
SEDIMENTATION	No Reported problems.	
WATERSHED DESCRIPTION	Almost entirely wooded.	3 dams in watershed. See Appendix D.

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT PROFILE - TOP of DAM — FILE NO. 8202
LOCKLIN POND DAM — SHEET NO. ___ OF ___ SHEETS
FOR ___
COMPUTED BY DLE — DATE 6-80 — CHECKED BY ___ — DATE ___

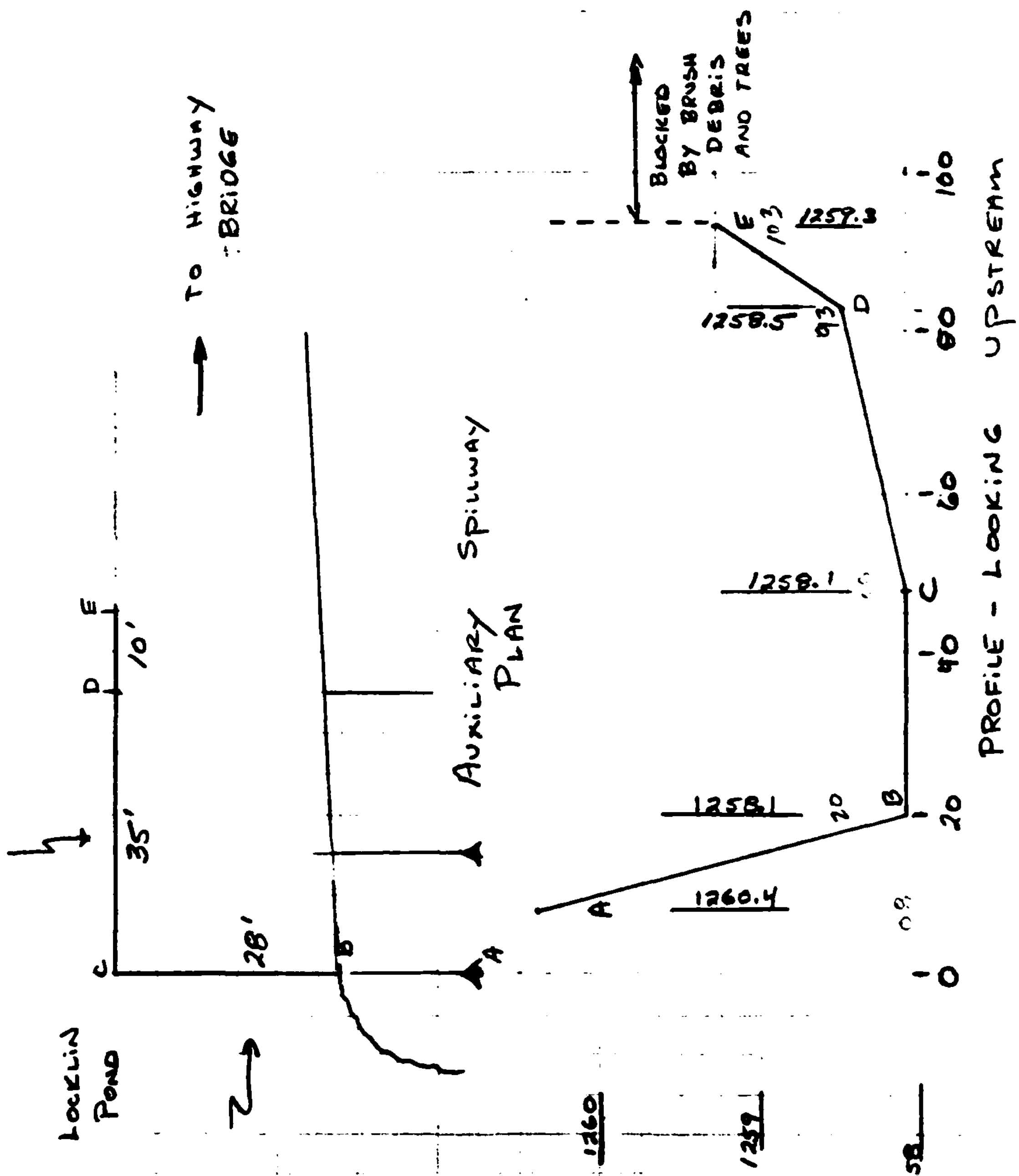


B-10

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT ______ FILE NO. ______
______ SHEET NO. ____ OF ____ SHEETS
FOR ______
COMPUTED BY ______ DATE ______ CHECKED BY ______ DATE ______

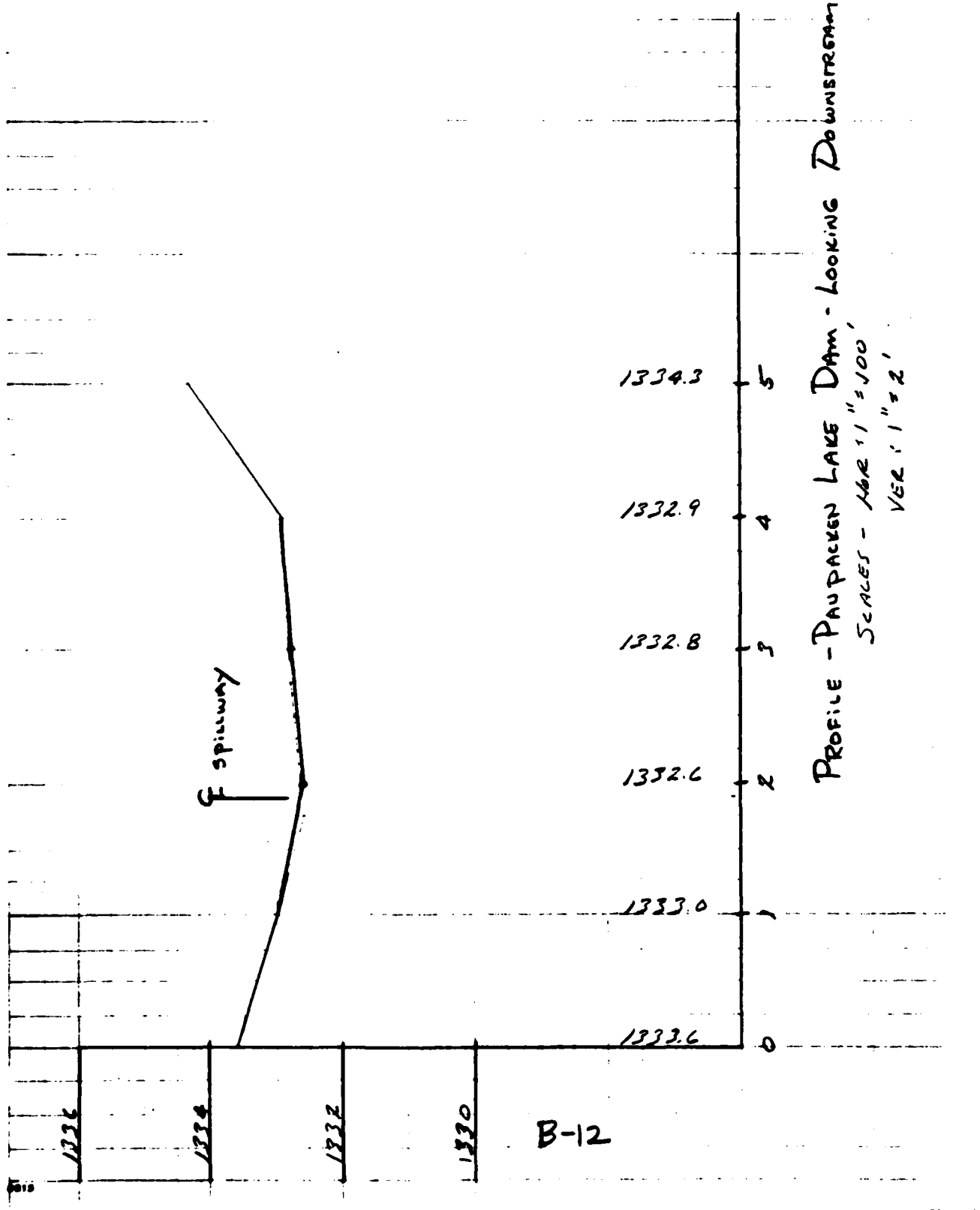
Locklin Pond
Auxiliary Spillway



6819

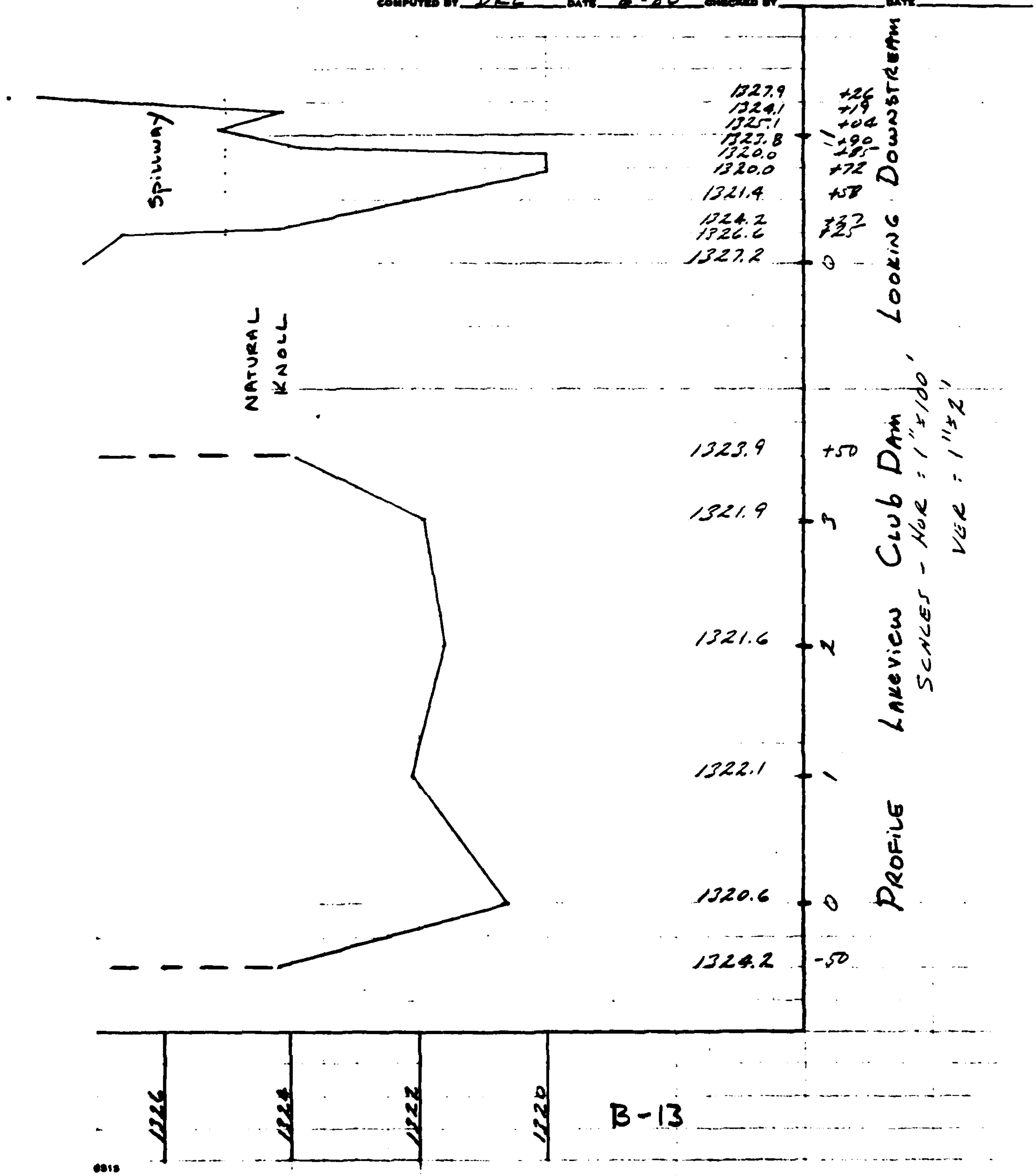
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT PROFILE - TOP of DAM FILE NO. 8202
PAUPACKAN LAKE DAM SHEET NO. ___ OF ___ SHEETS
FOR
COMPUTED BY DRE DATE 6-80 CHECKED BY ___ DATE ___



GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT: Profile - Top of Dam
Unnamed Dam U.S. of Locklin Pond
FILE NO. 8202
SHEET NO. ____ OF ____ SHEETS
FOR: (Hunting Club Property)
COMPUTED BY: DRE DATE: 6-80 CHECKED BY: ____ DATE: ____

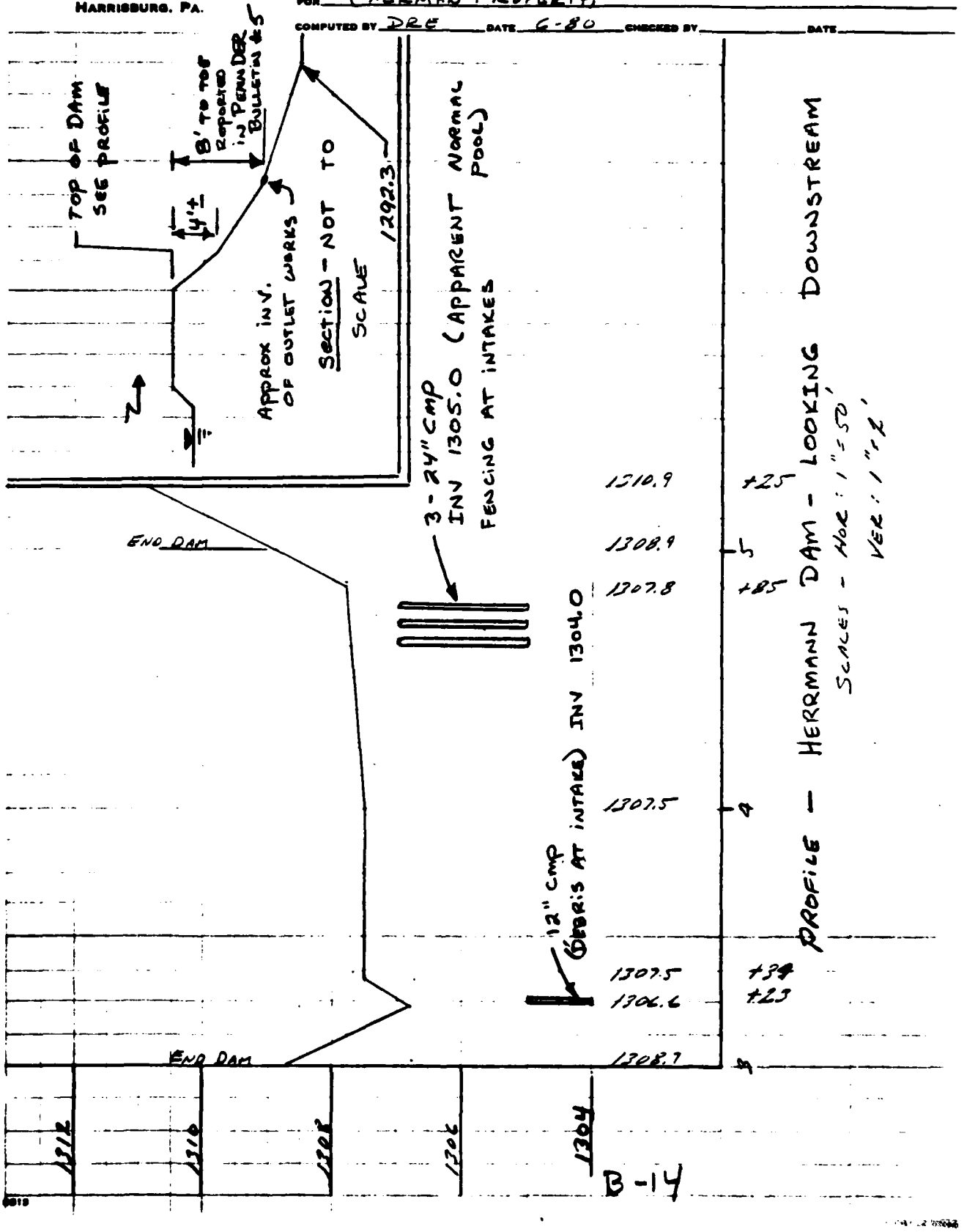


B-13

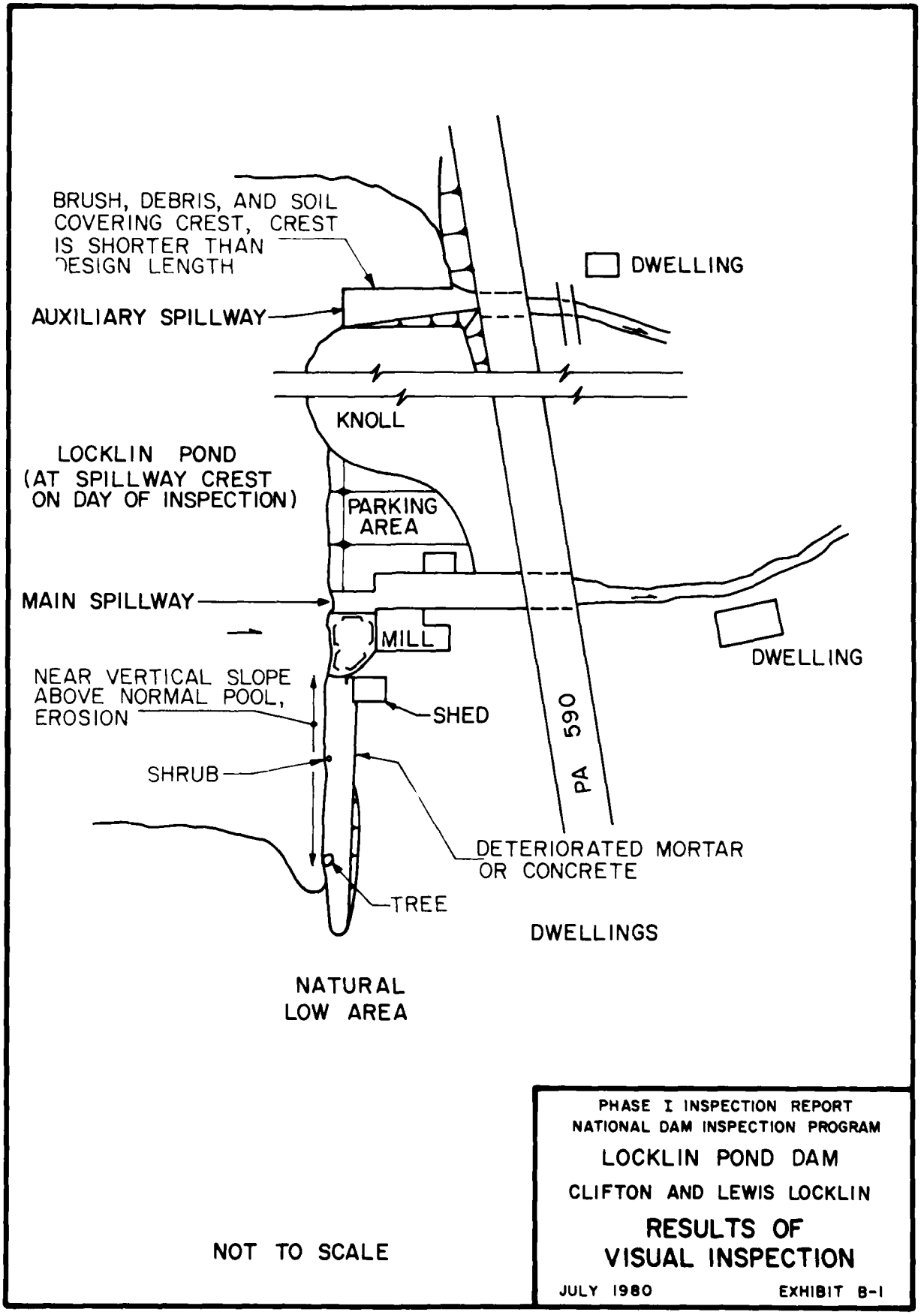
6815

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT PROFILE - TOP of DAM FILE NO. 6202
UNNAMED DAM U.S. of LAKE LIN POND SHEET NO. ____ OF ____ SHEETS
FOR (HERMAN PROPERTY)
COMPUTED BY DRE DATE 6-80 CHECKED BY ____ DATE ____



B-14



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LOCKLIN POND DAM

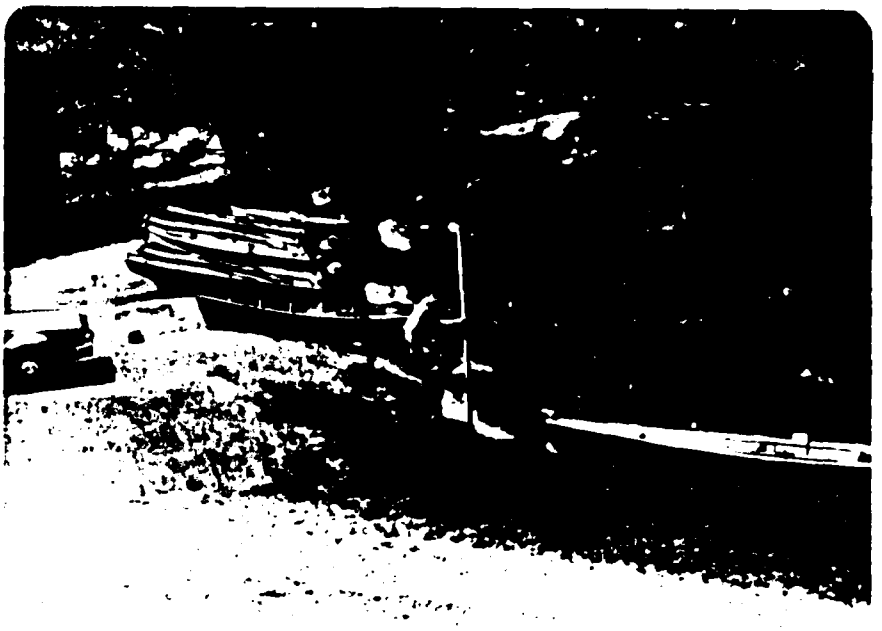
CLIFTON AND LEWIS LOCKLIN

RESULTS OF VISUAL INSPECTION

JULY 1980 EXHIBIT B-1

APPENDIX C

PHOTOGRAPHS



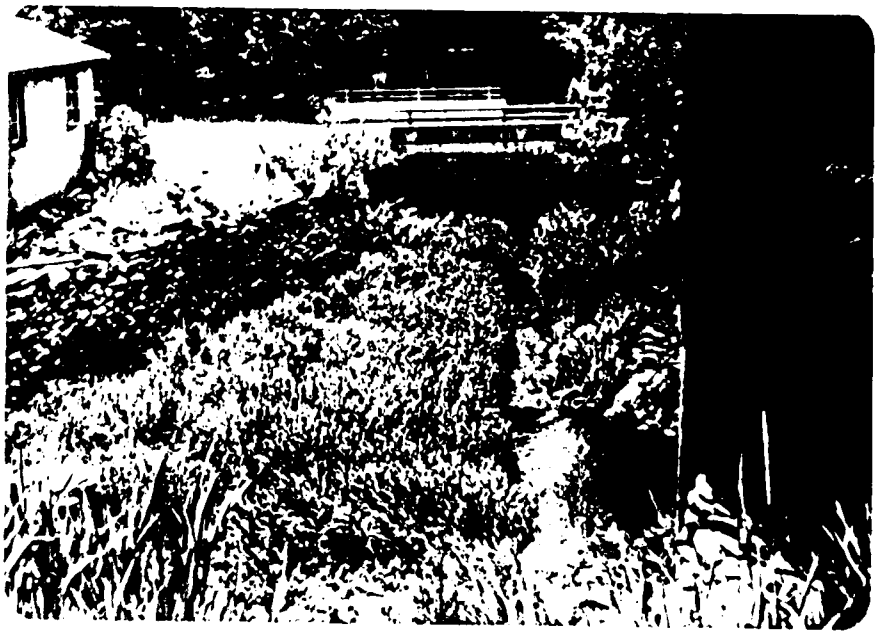
A. Embankment Left of Main Spillway

B. Embankment Right of Main Spillway

C. Downstream Slope Right of Main Spillway

... Downstream Slope Right of Main Spillway

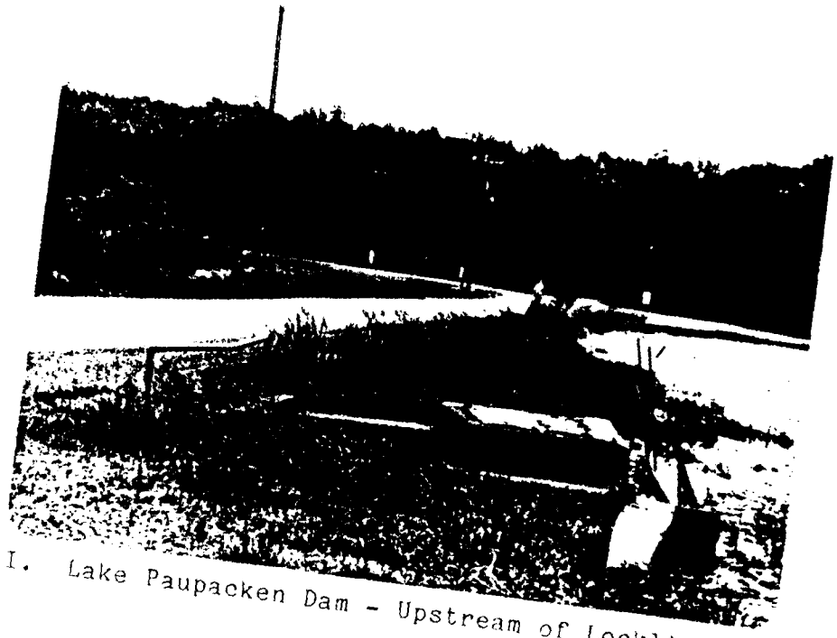
E. Main Spillway



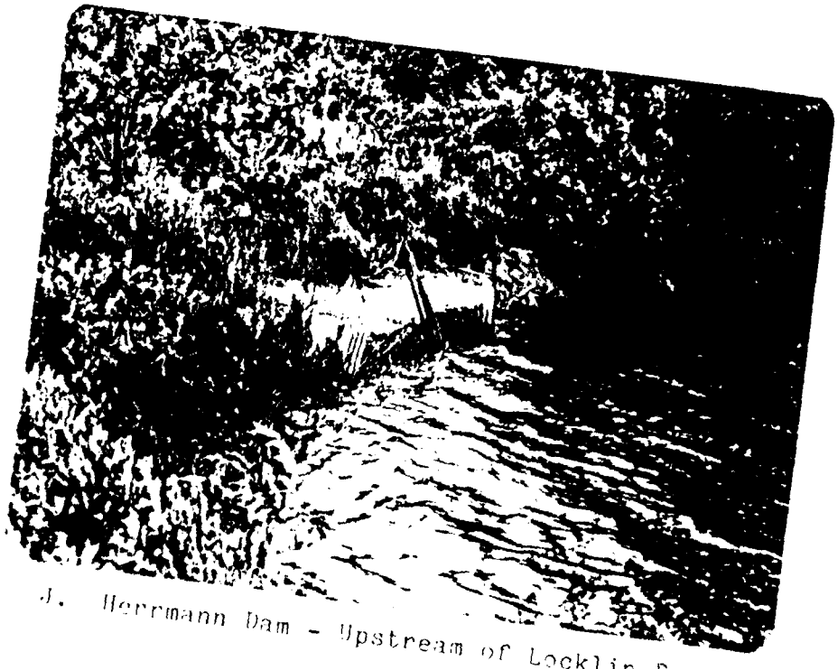
F. Main Spillway Exit Channel

G. Auxiliary Spillway

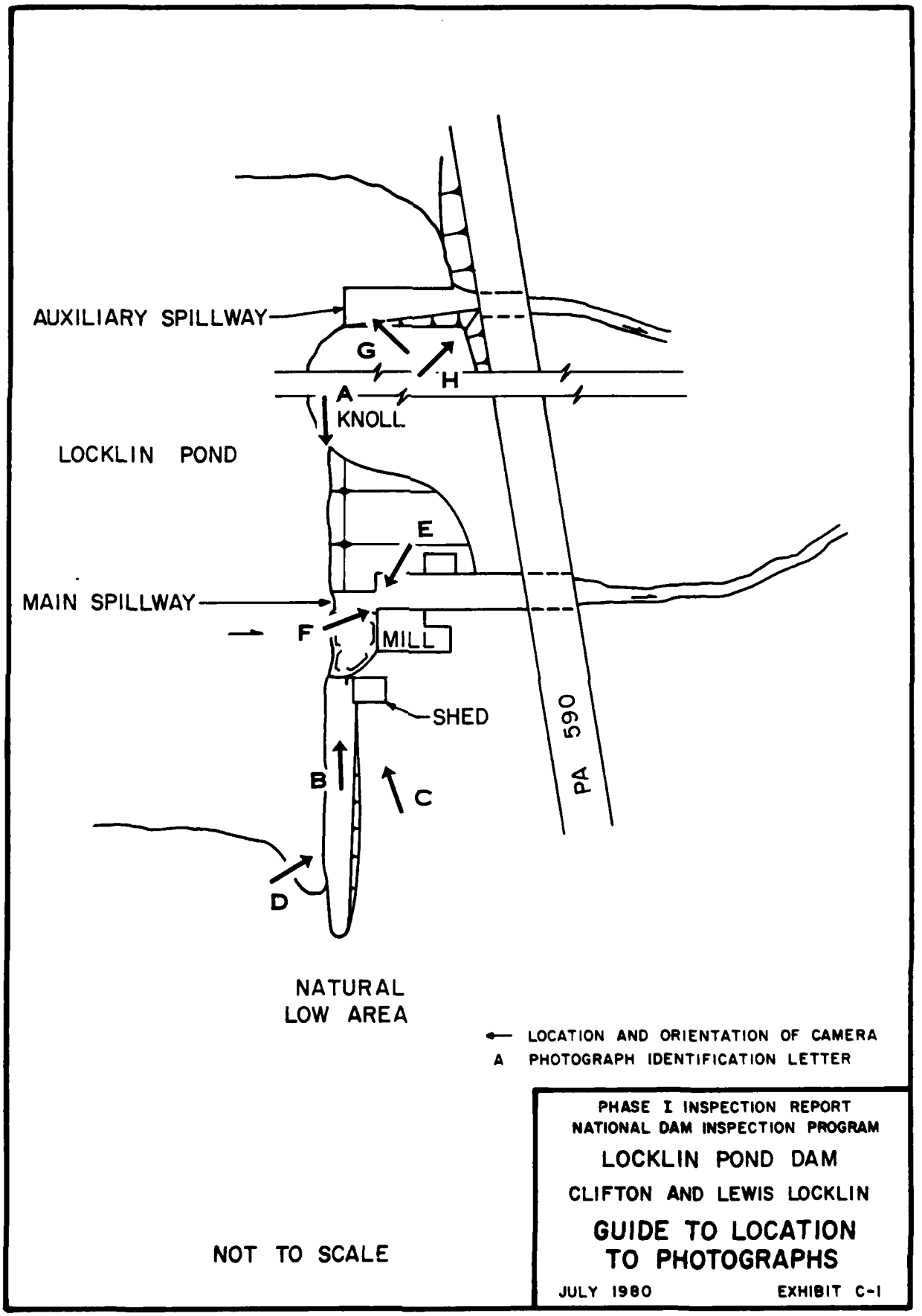
H. Auxiliary Spillway Exit Channel



I. Lake Paupacken Dam - Upstream of Locklin Pond



J. Herrmann Dam - Upstream of Locklin Pond



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LOCKLIN POND DAM

CLIFTON AND LEWIS LOCKLIN

GUIDE TO LOCATION TO PHOTOGRAPHS

JULY 1980 EXHIBIT C-1

APPENDIX D

HYDROLOGY AND HYDRAULICS

APPENDIX D

HYDROLOGY AND HYDRAULICS

Spillway Capacity Rating:

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

Description of Model:

If the Owner has not developed a PMF for the dam, the watershed is modeled with the HEC-1DB computer program, which was developed by the U.S. Army Corps of Engineers. The HEC-1DB computer program calculates a PMF runoff hydrograph (and percentages thereof) and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure. By modifying the rainfall criteria, it is also possible to model the 100-year flood with the program.

APPENDIX D

DELAWARE River Basin
Name of Stream: LAKEVILLE CREEK
Name of Dam: LOCKLIN POND
NDI ID No.: PA-00139
DER ID No.: 64-31
Latitude: N 41° 26' 20" Longitude: W 75° 16' 40"
Top of Dam Elevation: 1259.0
Streambed Elevation: 1246.2 Height of Dam: 13 ft
Reservoir Storage at Top of Dam Elevation: 448 acre-ft
Size Category: SMALL
Hazard Category: SIGNIFICANT (see Section 5)
Spillway Design Flood: VARIES 100 YEAR TO 1/2 PMF
SELECT 1/2 PMF BECAUSE OF POSSIBILITY OF LOSS OF LIFE

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
LAKE PAUPACKEN	1.3	11	765	DER ID 64-33
LAKEVIEW CLUB DAM	1.7	16	59	NO DER ID FLOWS TO HERRMANN DAM
HERRMANN DAM	1.2	14	60	DER ID 64-84

DOWNSTREAM DAMS

LAKE WALLENPAUPACK	0.9 TO LAKE	66	214,800 AT NORMAL POOL	DER ID 52-51 5760 ACRE-POOL POWER DAM

DELAWARE River Basin

Name of Stream: LAKEVILLE CREEK

Name of Dam: LOCKLIN POND

DETERMINATION OF PMF RAINFALL & UNIT HYDROGRAPH

UNIT HYDROGRAPH DATA:

Sub-area	Drainage Area (square miles)	Cp (1)	Ct (2)	L miles (3)	L_{ca} miles (4)	L' miles (5)	Tp hours (6)	Map Area (7)	Plate (8)
P-1	2.62	0.45	1.23	3.26	1.12	N/A	1.81	1	A
H-1	.68	0.45	1.23	1.06	.49	N/A	1.01	1	A
H-2	.56	0.45	1.23	1.23	.38	N/A	.98	1	A
L-1	1.07	0.45	1.23	N/A	N/A	.47	.78	1	A
Total	4.93								

(See Sketch on Sheet D-4)

(1) & (2): Snyder Unit Hydrograph coefficients supplied by Baltimore District, Corps of Engineers on maps and plates referenced in (7) & (8)

The following are measured from the outlet of the subarea:

(3): Length of main watercourse extended to divide

(4): Length of main watercourse to the centroid

The following is measured from the upstream end of the reservoir at normal pool:

(5): Length of main watercourse extended to divide

(6): $Tp=C_t \times (L \times L_{ca})^{0.3}$, except where the centroid of the subarea is located in the reservoir. Then $Tp=C_t \times (L')^{0.6}$

Initial flow is assumed at 1.5 cfs/sq. mile

Computer Data: QRCSN = -0.05 (5% of peak flow)
RTIOR = 2.0

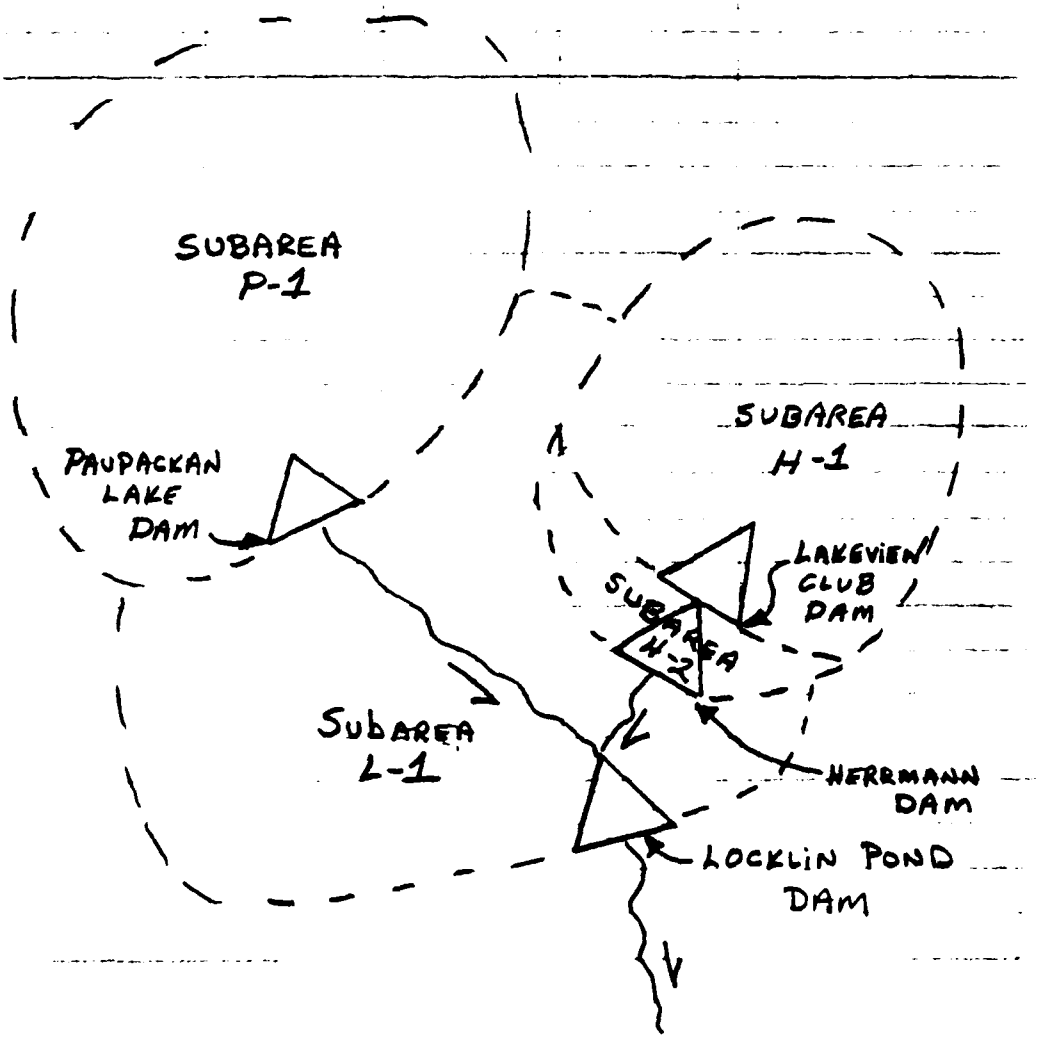
RAINFALL DATA:

PMF Rainfall Index= 22.0 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone:	N/A	1
Geographic Adjustment Factor:	N/A	1.0
Revised Index Rainfall:	N/A	22.0

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	111
12 hours	123
24 hours	133
48 hours	142
72 hours	
96 hours	



Sketch
OF
System

6019

Data for Dam at Outlet of Subarea P-1 (See sketch on Sheet D-4)

Name of Dam: LAKE PAUPACKEN

STORAGE DATA:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1321.4 =ELEVO*	0	0	0	STREAMBED AT TOE
1331.0 =ELEV1	239 =A1		765 =S1	
1332.6	258		1,167	TOP DAM
1340.0 **	353			

* ~~ELEVO = ELEV1 − (3S1/A1)~~ $S_1 = A_1(ELEV1 - ELEVO)/3$

** Planimetered contour at least 10 feet above top of dam ±

Reservoir Area at Normal Pool is 14 percent of subarea watershed.

BREACH DATA: Not Used

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: _____

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) _____ fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = _____ ft., C = ____ Top of Dam El.= ____

HMAX + Top of Dam El. = _____ = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = _____ ft (width of bottom of breach)
Z = _____ (side slopes of breach)
ELBM = _____ (bottom of breach elevation, minimum of zero storage elevation)
WSEL = _____ (normal pool elevation)
T FAIL = _____ mins = _____ hrs (time for breach to develop)

Data for Dam at Outlet of Subarea P-1

Name of Dam: PAUPACKEN LAKE

SPILLWAY DATA: SEE NEXT 2 SHEETS

	Existing Conditions	Design Conditions
Top of Dam Elevation		
Spillway Crest Elevation		
Spillway Head Available (ft)		
Type Spillway		
"C" Value - Spillway		
Crest Length - Spillway (ft)		
Spillway Peak Discharge (cfs)		
Auxiliary Spillway Crest Elev.		
Auxiliary Spill. Head Avail. (ft)		
Type Auxiliary Spillway		
"C" Value - Auxiliary Spill. (ft)		
Crest Length - Auxil. Spill. (ft)		
Auxiliary Spillway Peak Discharge (cfs)		
Combined Spillway Discharge (cfs)		

Spillway Rating Curve: FROM SHEET D-8

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
1331.0			0
1331.5			14
1332.0			40
1332.5			279
1333.0			289
1334.0			310
1335.0			329
1336.0			347
1337.0			364
1340.0			410

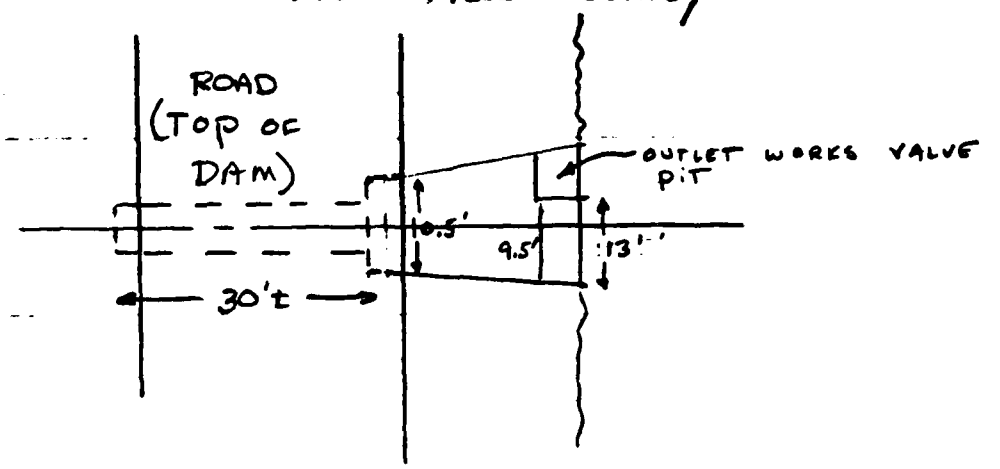
OUTLET WORKS RATING: USED AS SPILLWAY

	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	1325.3	1321.8	
Invert of Inlet	-	-	
Type	CMP	CMP	
Diameter (ft) = D	4	3	
Length (ft) = L	30	30	
Area (sq. ft) = A	12.57	7.07	
N	.024	.024	
K Entrance	0.5	0.5	
K Exit	1.0	1.0	
K Friction=$29.1N^2L/R^{4/3}$	.50	.74	
Sum of K	2.00	2.24	
$(1/K)^{0.5}$ = C	0.71	0.67	
Maximum Head (ft) = HM			SEE SHEET D-7 & D-8
Q = $CA\sqrt{2g(HM)}$ (cfs)			
Q Combined (cfs)			

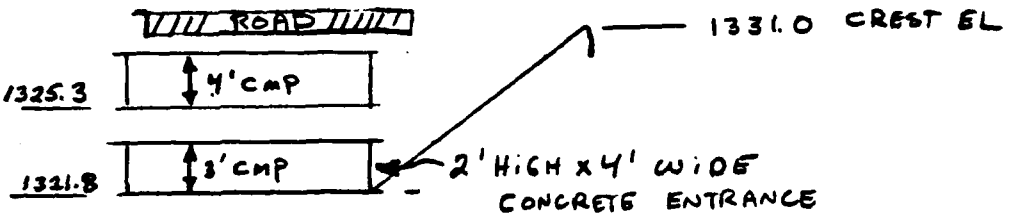
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT LAKE PAUPACKEN SPILLWAY FILE NO.
SHEET NO. OF SHEETS
FOR
COMPUTED BY DATE CHECKED BY DATE

FROM FIELD SURVEY



PLAN
(NOT TO SCALE)



LOW FLOW CONTROL

$Q = CLH^{3/2}$ $L = 13'$

$H = POOL - 1331.0$

$C = 3.1$

HIGH POOL CONTROL

SEE PREVIOUS SHEET

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT LAKE PAUPACKEN Spillway FILE NO.
SHEET NO. OF SHEETS
FOR
COMPUTED BY DATE CHECKED BY DATE

FROM SHEET D-6

4' cmp C = 0.71 A = 12.57
INV = 1325.3
3' cmp C = 0.67 A = 7.07
INV = 1321.8
USE EFFECTIVE INVERT = INV + D/2
pipe $Q = CA\sqrt{2gH}$

4' cmp $Q = 0.71 \times 12.57 \times \sqrt{64.36 (POOL - 1327.3)}$
3' cmp $Q = 0.67 \times 7.07 \times \sqrt{64.36 (POOL - 1323.3)}$
$Q_{4'} = 71.6\sqrt{POOL - 1327.3}$
$Q_{3'} = 38.0\sqrt{POOL - 1323.3}$

POOL	Q LOW FLOW	$Q_{4'+3'}$	Q SPILLWAY
1331.0	0	0	0
1331.5	14	N/A	14
1332.0	40	267	40
1332.5	74	279	279
1333.0		289	289
1334.0		310	310
1335.0	FLOW OVER OUTLET WORKS & AROUND SIDES, SWITCH CONTROL	329	329
1336.0		347	347
13370		364	364
1340.0		410	410

Data for Dam at Outlet of Subarea H-1 (See sketch on Sheet D-4)

Name of Dam: Lakeview Club

STORAGE DATA:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1305.0 =ELEV0*	0	0	0	STREAMBED AT TOE
1320.0 =ELEV1	10.2 =A1*		51 =S1	SPILLWAY
1320.6	10.6		59	TOP OF DAM
1340.00	25.2			

* ~~ELEV0 = ELEV1 (98)/A1~~ $S_1 = A_1 (ELEV1 - ELEV0)/3$

** Planimetered contour at least 10 feet above top of dam

* POOL CROSSES CONTOUR ON USGS MAP, AVG OF 1320 CONTOUR & POOL AREA USED

Reservoir Area at Normal Pool is 2 percent of subarea watershed.

BREACH DATA: Not Used

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: _____

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) _____ fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = _____ ft., C = ____ Top of Dam El.= ____

HMAX + Top of Dam El. = _____ = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = _____ ft (width of bottom of breach)
Z = _____ (side slopes of breach)
ELBM = _____ (bottom of breach elevation, minimum of zero storage elevation)
WSEL = _____ (normal pool elevation)
T FAIL= _____ mins = _____ hrs (time for breach to develop)

Data for Dam at Outlet of Subarea H-1

Name of Dam: LAKEVIEW CLUB

SPILLWAY DATA:	Existing Conditions	Design Conditions
Top of Dam Elevation	1320.6	NOT
Spillway Crest Elevation	1320.0	PERTINENT
Spillway Head Available (ft)		TO
Type Spillway	SEE	THIS
"C" Value - Spillway	NEXT	REPORT
Crest Length - Spillway (ft)	SHEET	
Spillway Peak Discharge (cfs)		
Auxiliary Spillway Crest Elev.		
Auxiliary Spill. Head Avail. (ft)		
Type Auxiliary Spillway		
"C" Value - Auxiliary Spill. (ft)		
Crest Length - Auxil. Spill. (ft)		
Auxiliary Spillway Peak Discharge (cfs)		
Combined Spillway Discharge (cfs)		

Spillway Rating Curve: SEE NEXT SHEET

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
1320.0			0
1320.7			25
1321.3			81
1322.5			280
1323.7			618
1324.9			1,102
1327.2			2,862
1344.8			27,357

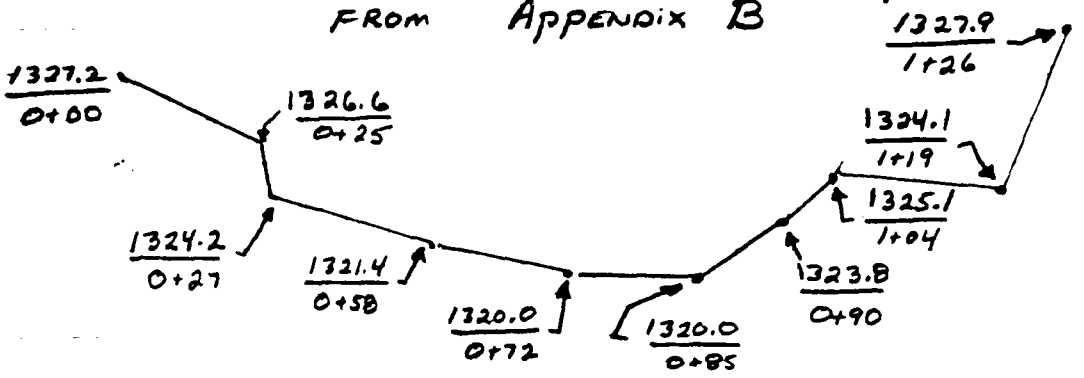
OUTLET WORKS RATING:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	NOT PERTINENT TO		
Invert of Inlet	THIS REPORT		
Type			
Diameter (ft) = D			
Length (ft) = L			
Area (sq. ft) = A			
N			
K Entrance			
K Exit			
K Friction=$29.1_N{}^2L/R^{4/3}$			
Sum of K			
$(1/K)^{0.5} = C$			
Maximum Head (ft) = HM			
$Q = CA\sqrt{2g(HM)}$(cfs)			
Q Combined (cfs)			

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

LAKEVIEW CLUB SPILLWAY

FROM APPENDIX B



SPILLWAY SECTION (NOT TO SCALE)

$Q = \frac{2.7}{3.1}\sqrt{\frac{A^3 g}{T}}$ d = depth A = AREA T = topwidth

POOL = INV + d + hv $hv = \frac{Q^2}{2gA^2}$ INV: 1320

(by desk calculator)

depth	Q	POOL
0	0	1320.0
0.5	25	1320.7
1.0	81	1321.3
2.0	280	1322.5
3.0	618	1323.7
4.0	1,102	1324.9
6.0	2,862	1327.2
19.0	37,357	1344.8

Data for Dam at Outlet of Subarea H-2 (See sketch on Sheet D-4)

Name of Dam: HERRMANN DAM

STORAGE DATA:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks (SEE PROFILE IN APPENDIX B)
1292.3 =ELEVO*	0	0	0	STREAMBED AT TOE
1305.0 =ELEV1	9.8 =A1		43 =S1	Spillway Crest
1306.6	12.2		60	Top Dam
1320.0 **	42			

* ~~ELEVO = ELEV1 − (3S1/A1)~~ $S_1 = (ELEV1 - ELEVO) \times A/3$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Normal Pool is 3 percent of subarea watershed.

BREACH DATA: Not Used

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: _____

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) _____ fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = _____ ft., C = ____ Top of Dam El.= ____

HMAX + Top of Dam El. = _____ = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = _____ ft (width of bottom of breach)
Z = _____ (side slopes of breach)
ELBM = _____ (bottom of breach elevation, minimum of zero storage elevation)
WSEL = _____ (normal pool elevation)
T FAIL= _____ mins = _____ hrs (time for breach to develop)

Data for Dam at Outlet of Subarea H-2

Name of Dam: HERRMANN DAM

SPILLWAY DATA: See Outlet Works	Existing Conditions	Design Conditions
Top of Dam Elevation		
Spillway Crest Elevation		
Spillway Head Available (ft)		
Type Spillway		
"C" Value - Spillway		
Crest Length - Spillway (ft)		
Spillway Peak Discharge (cfs)		
Auxiliary Spillway Crest Elev.		
Auxiliary Spill. Head Avail. (ft)		
Type Auxiliary Spillway		
"C" Value - Auxiliary Spill. (ft)		
Crest Length - Auxil. Spill. (ft)		
Auxiliary Spillway Peak Discharge (cfs)		
Combined Spillway Discharge (cfs)		

Spillway Rating Curve: SEE BELOW: Spillway is 3 - 24" DIA CMP

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)

OUTLET WORKS RATING:	Outlet 1 (3X)	~~Outlet 2~~	Outlet 3 (3 combined)
Invert of Outlet	1305.0		1305.0
Invert of Inlet	1305.0		1305.0
Type	CMP		CMP
Diameter (ft) = D	2		2
Length (ft) = L	20 ±		20
Area (sq. ft) = A	3.14		9.42
N	.024		
K Entrance	0.5		
K Exit	1.0		
K Friction=$29.1N^2L/R^{4/3}$	.84		
Sum of K	2.3		2.3
$(1/K)^{0.5}$ = C	.65		.65
Maximum Head (ft) = HM			1.1
$Q = CA\sqrt{2g(HM)}$ (cfs)			52
Q Combined (cfs)			52

Data for Dam at Outlet of Subarea L-1 (See sketch on Sheet D-4)

Name of Dam: LOCKLIN POND

STORAGE DATA:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1246.2 =ELEVO*	0	0	0	STREAMBED AT TOE
1258.1 =ELEV1	91 =A1		365 =S1†	
1259.0	93		448	
1260.0	95		541	
1261.0	97		637	
1280 **	142			

* ELEVO = ELEV1 - $(3S_1/A_1)$ $S_1 = A_1(ELEV1 - ELEVO)/3$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Normal Pool is 13 percent of subarea watershed.

† RECORD DATA IS 264 ACRE-FEET

BREACH DATA: NOT USED

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: _____

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) _____ fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = _____ ft., C = ____ Top of Dam El.= ____

HMAX + Top of Dam El. = _____ = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = _____ ft (width of bottom of breach)
Z = _____ (side slopes of breach)
ELBM = _____ (bottom of breach elevation, minimum of zero storage elevation)
WSEL = _____ (normal pool elevation)
T FAIL= _____ mins = _____ hrs (time for breach to develop)

Data for Dam at Outlet of Subarea L-1

Name of Dam: LOCKLIN POND

SPILLWAY DATA:	Existing Conditions	Design Conditions
Top of Dam Elevation	1259.0	1260.1★
Spillway Crest Elevation	1258.1	1258.1
Spillway Head Available (ft)	0.9	2.0
Type Spillway	SEE TEXT	
"C" Value - Spillway	SEE BELOW	
Crest Length - Spillway (ft)		
Spillway Peak Discharge (cfs)	93	337
Auxiliary Spillway Crest Elev.	1258.1	1258.1
Auxiliary Spill. Head Avail. (ft)	0.9	2.0
Type Auxiliary Spillway	BROAD CRESTED	SIDE CHANNEL
"C" Value - Auxiliary Spill. (ft)	2.7	2.7
Crest Length - Auxil. Spill. (ft)	SEE APPENDIX B	
Auxiliary Spillway Peak Discharge (cfs)	195	642
Combined Spillway Discharge (cfs)	288	979

★ See Section 5

Spillway Rating Curve: FROM FOLLOWING SHEET

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
1258.1	0	0	0
1258.7	37	94	131
1259.5	186	364	550
1260.1	337	642	979
1260.6	562	1,048	1,610
1262.1	1,113	2,079	3,192
1263.5	1,779	3,336	5,115
1264.9	2,541	4,778	7,319
1271.8	7,497	14,173	21,670

OUTLET WORKS RATING:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	NONE	AT SITE	
Invert of Inlet			
Type			
Diameter (ft) = D			
Length (ft) = L			
Area (sq. ft) = A			
N			
K Entrance			
K Exit			
K Friction=$29.1 N^2 L/R^{4/3}$			
Sum of K			
$(1/K)^{0.5} = C$			
Maximum Head (ft) = HM			
$Q = CA\sqrt{2g(HM)}$ (cfs)			
Q Combined (cfs)			

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

AUXILIARY Spillway } FOR PROFILES
MAIN Spillway } SEE APPENDIX B

DISCHARGE RATING

ADJUSTED CRITICAL depth

$Q = \frac{2.7}{3.1}\sqrt{\frac{A^3 g}{T}}$ d = depth A = AREA
T = TOPWIDTH

POOL = INV + depth + hv

$hv = \frac{Q^2}{2gA^2}$

BY DESK CALCULATOR

MAIN Spillway			AUXILIARY Spillway		
d	Q	POOL	d	Q	POOL
0	0	1258.1	0	0	1258.1
0.5	37	1258.7	0.5	94	1258.7
1.0	186	1259.5	1.0	318	1259.4
1.5	337	1260.1	1.5	642	1260.1
2.0	562	1260.8	2.0	1,048	1260.8
3.0	1,113	1262.1	3.0	2,079	1262.1
4.0	1,779	1263.5	4.0	3,336	1263.5
5.0	2,541	1264.9	5.0	4,778	1264.9
10.0	7,497	1271.8	10.0	14,173	1271.8

INDEX
SELECTED COMPUTER OUTPUT

```
********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
 LAST MODIFICATION  01 APR 80
********************************
A1                        NATIONAL DAM INSPECTION PROGRAM
A2                                LAKEVILLE CREEK
A3                               LOCKLIN POND DAM
B     300       0      15       0       0       0       0       0      -4       0
B1      5
J       1       9       1
J1    1.0      .5      .4      .3     .25      .2     .15     .10     .05
K       0       1                                       1
K1        RUNOFF INTO PAUPACKAN LAKE (SUBAREA P-1)
M       1       1    2.62            4.93                               1
P            22.0     111     123     133     142
T                                                       1     .05             .14
W    1.81     .45
X    -1.5    -.05     2.0
K       1       1                                       1
K1        ROUTE THROUGH LAKE PAUPACKAN DAM
Y                               1
Y1      1                                           -1331      -1
Y4   1331  1331.5  1332.0  1332.5  1333.0    1334    1335    1336    1337    1340
Y5      0      14      40     279     289     310     329     347     364     410
$A      0     239     353
$E1321.4     1331    1340
$$   1331
$D1332.6
SL      1     160     285     305     450     500     500
$V1332.6  1332.8  1332.9  1333.0  1333.6  1334.3    1340
K       1       4                                       1
K1        SHIFT POINT 1 TO POINT 3
Y                               0
Y1      1
K       0       2                                       1
K1        RUNOFF INTO LAKEVIEW CLUB POND (SUBAREA H-1)
M       1       1     .68            4.93                               1
P              22     111     123     133     142
T                                                     1.0     .05             .02
W    1.01     .45
X    -1.5    -.05     2.0
K       1       2                                       1
K1        ROUTE THROUGH LAKEVIEW CLUB DAM
Y                               1
Y1      1                                           -1320      -1
Y4   1320  1320.7  1321.3  1322.5  1323.7  1324.9  1327.2  1344.8
Y5      0      25      81     280     618    1102    2862   37357
$A      0    10.2    25.2
$E   1305    1320    1340
$$   1320
$D1320.6
SL      1      80     170     325     395     400     400
$V1320.6  1321.6  1321.9  1322.1  1323.9  1324.2    1340
K       0       3                                       1
```

```
K1      UNCONTROLLED RUNOFF INTO HERRMANN DAM (SUBAREA H-2)
M      1       1     .56            4.93                                       1
P             22     111     123     133     142
T                                                   1.0     .05                     .03
W    .98     .45
X   -1.5    -.05     2.0
K      2       3                                      1
K1      COMBINE INFLOW TO HERRMANN DAM
K      1       3                                      1
K1      ROUTE THROUGH HERRMANN DAM
Y                              1
Y1     1                                          -1305       0
$A     0     9.8      42
$E1292.3    1305    1320
$$  1305       0       0     1.5    1305     .65    9.42     0.5
$D1306.6
$L     1      19      85     175     197     200     225     225
$V1306.6  1307.5 1307.51  1307.8  1308.7  1308.9  1310.9    1320
K      1       4                                      1
K1      SHIFT TO POINT 4
Y                              0
Y1     1
K      0       4                                      1
K1      UNCONTROLLED RUNOFF INTO LOCKLIN POND (SUBAREA L-1
M      1       1    1.07            4.93                                       1
P             22     111     123     133     142
T                                                   1.0     .05                     .13
W    .78     .45
X   -1.5    -.05     2.0
K      3       4                                      1
K1      COMBINE RUNOFF TO LOCKLIN POND
K      1       4                                      1
K1      ROUTE THROUGH LOCKLIN POND
Y                              1
Y1     1                                        -1258.1      -1
Y41258.1  1258.7  1259.5  1260.1  1260.8  1262.1  1263.5  1264.9  1271.8
Y5     0     131     550     979    1610    3192    5115    7319   21670
$A     0      91     142
$E1246.2  1258.1    1280
$$1258.1
$D1259.0
$L     0       4      27     143     225     275     360     430     430
$V1259.0  1259.1  1259.5 1259.75    1260  1260.5    1261  1261.5    1280
K     99
```

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 1.00	RATIO 2 .50	RATIO 3 .40	RATIO 4 .30	RATIO 5 .25	RATIO 6 .20	RATIO 7 .15	RATIO 8 .10	RATIO 9 .05
HYDROGRAPH AT	1	2.62	1	5520.	2760.	2208.	1656.	1380.	1104.	828.	552.	276.
	(	6.79)	(	156.31)(	78.16)(	62.53)(	46.89)(	39.09)(	31.26)(	23.45)(	15.63)(	7.82)
ROUTED TO	1	2.62	1	4671.	1858.	1275.	720.	474.	297.	234.	91.	18.
	(	6.79)	(	132.28)(	52.60)(	36.11)(	20.38)(	13.42)(	8.42)(	6.62)(	2.29)(	.52)
ROUTED TO	4	2.62	1	4671.	1858.	1275.	720.	474.	297.	234.	91.	18.
	(	6.79)	(	132.28)(	52.60)(	36.11)(	20.38)(	13.42)(	8.42)(	6.62)(	2.29)(	.52)
HYDROGRAPH AT	2	.68	1	1953.	976.	781.	586.	488.	391.	293.	195.	98.
	(	1.76)	(	55.30)(	27.65)(	22.12)(	16.59)(	13.83)(	11.06)(	8.30)(	5.53)(	2.77)
ROUTED TO	2	.68	1	1955.	974.	777.	578.	477.	379.	279.	180.	78.
	(	1.76)	(	55.35)(	27.57)(	22.00)(	16.38)(	13.51)(	10.72)(	7.90)(	5.09)(	2.22)
HYDROGRAPH AT	3	.56	1	1643.	821.	657.	493.	411.	329.	246.	164.	82.
	(	1.45)	(	46.52)(	23.26)(	18.61)(	13.96)(	11.63)(	9.30)(	6.98)(	4.65)(	2.33)
2 COMBINED	3	1.24	1	3598.	1795.	1434.	1071.	886.	699.	513.	334.	148.
	(	3.21)	(	101.87)(	50.83)(	40.61)(	30.33)(	25.08)(	19.79)(	14.54)(	9.45)(	4.19)
ROUTED TO	3	1.24	1	3534.	1761.	1406.	1048.	866.	682.	500.	301.	79.
	(	3.21)	(	100.07)(	49.86)(	39.82)(	29.69)(	24.52)(	19.30)(	14.15)(	8.52)(	2.24)
ROUTED TO	4	1.24	1	3534.	1761.	1406.	1048.	866.	682.	500.	301.	79.
	(	3.21)	(	100.07)(	49.86)(	39.82)(	29.69)(	24.52)(	19.30)(	14.15)(	8.52)(	2.24)
HYDROGRAPH AT	4	1.07	1	3506.	1753.	1403.	1052.	877.	701.	526.	351.	175.
	(	2.77)	(	99.29)(	49.65)(	39.72)(	29.79)(	24.82)(	19.86)(	14.89)(	9.93)(	4.96)
3 COMBINED	4	4.93	1	9243.	3681.	2960.	2113.	1689.	1330.	966.	587.	225.
	(	12.77)	(	261.72)(	104.23)(	83.82)(	59.84)(	47.82)(	37.67)(	27.35)(	16.05)(	6.37)
ROUTED TO	4	4.93	1	9206.	3606.	2671.	1887.	1488.	1067.	676.	379.	118.
	(	12.77)	(	260.69)(	102.11)(	75.63)(	53.42)(	42.14)(	30.20)(	19.14)(	10.73)(	3.35)

SUMMARY OF DAM SAFETY ANALYSIS

Paupackan Lake Dam

PLAN 1 ••••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1331.00	1341.00	1342.60
STORAGE	765.	765.	1162.
OUTFLOW	0.	0.	291.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1335.02	2.42	1821.	4671.	21.50	43.00	0.00
.50	1334.00	1.40	1535.	1858.	17.25	43.75	0.00
.40	1333.71	1.11	1456.	1275.	16.00	44.25	0.00
.30	1333.36	.76	1357.	720.	13.75	45.25	0.00
.25	1333.11	.51	1294.	474.	12.00	46.00	0.00
.20	1332.78	.18	1208.	297.	7.25	46.75	0.00
.15	1332.41	0.00	1112.	234.	0.00	46.50	0.00
.10	1332.09	0.00	1031.	81.	0.00	48.75	0.00
.05	1331.58	0.00	906.	18.	0.00	51.25	0.00

PLAN 1 ....

SUMMARY OF DAM SAFETY ANALYSIS

LAKEVIEW CLUB DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1320.00	1320.00	1320.60
STORAGE	51.	51.	57.
OUTFLOW	0.	0.	21.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1322.00	2.39	96.	1055.	28.00	40.75	0.00
.50	1322.45	1.85	78.	976.	20.50	40.75	0.00
.40	1322.31	1.71	76.	777.	19.00	40.75	0.00
.30	1322.16	1.54	74.	578.	17.00	40.75	0.00
.25	1322.03	1.43	73.	477.	15.25	41.00	0.00
.20	1321.90	1.30	71.	379.	13.00	41.00	0.00
.15	1321.72	1.12	69.	279.	11.50	41.00	0.00
.10	1321.49	.88	67.	180.	9.75	41.00	0.00
.05	1321.09	.49	63.	78.	6.75	41.25	0.00
						41.75	0.00

SUMMARY OF DAM SAFETY ANALYSIS

HERRMANN DAM

PLAN 1 ••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1305.00	1314.0	1324.0
STORAGE	41.	41.	123.
OUTFLOW	0.	0.	42.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1310.71	4.11	123.	3534.	23.00	40.75	0.00
.50	1309.54	2.94	102.	1761.	17.75	41.00	0.00
.40	1309.26	2.66	97.	1406.	15.75	41.00	0.00
.30	1308.96	2.36	92.	1048.	14.00	41.00	0.00
.25	1308.76	2.16	89.	866.	13.00	41.00	0.00
.20	1308.56	1.96	86.	682.	12.00	41.00	0.00
.15	1308.34	1.74	83.	500.	10.75	41.25	0.00
.10	1308.05	1.45	79.	301.	8.75	41.75	0.00
.05	1307.76	.56	66.	79.	5.25	42.75	0.00

SUMMARY OF DAM SAFETY ANALYSIS

Locklin Pond Dam

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1258.10	1258.10	1259.00
STORAGE	361.	361.	444.
OUTFLOW	0.	0.	288.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1262.66	3.66	799.	9206.	28.50	42.00	0.00
.50	1261.19	2.19	652.	3606.	23.25	42.50	0.00
.40	1260.96	1.96	620.	2671.	22.00	41.50	0.00
.30	1260.50	1.50	585.	1887.	20.25	41.75	0.00
.25	1260.28	1.28	564.	1488.	18.75	42.25	0.00
.20	1260.01	1.01	539.	1067.	15.75	42.50	0.00
.15	1259.64	.64	504.	676.	11.00	42.75	0.00
.10	1259.17	.17	460.	379.	3.50	43.00	0.00
.05	1258.64	0.00	411.	118.	0.00	44.25	0.00

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

SUMMARY OF PERTINENT RESULTS
PMF RAINFALL = 24.99"

AT LOCKLIN POND:	PMF	½ PMF = SDF
RUNOFF (inches)	22.86	11.43
PEAK INFLOW (CFS)	9,243	3,681
PEAK OUTFLOW (CFS)	9,206	3,606
DEPTH OF OVERTOPPING (FT)	3.66	2.19
DURATION OF OVERTOPPING (HRS)	28.50	23.25

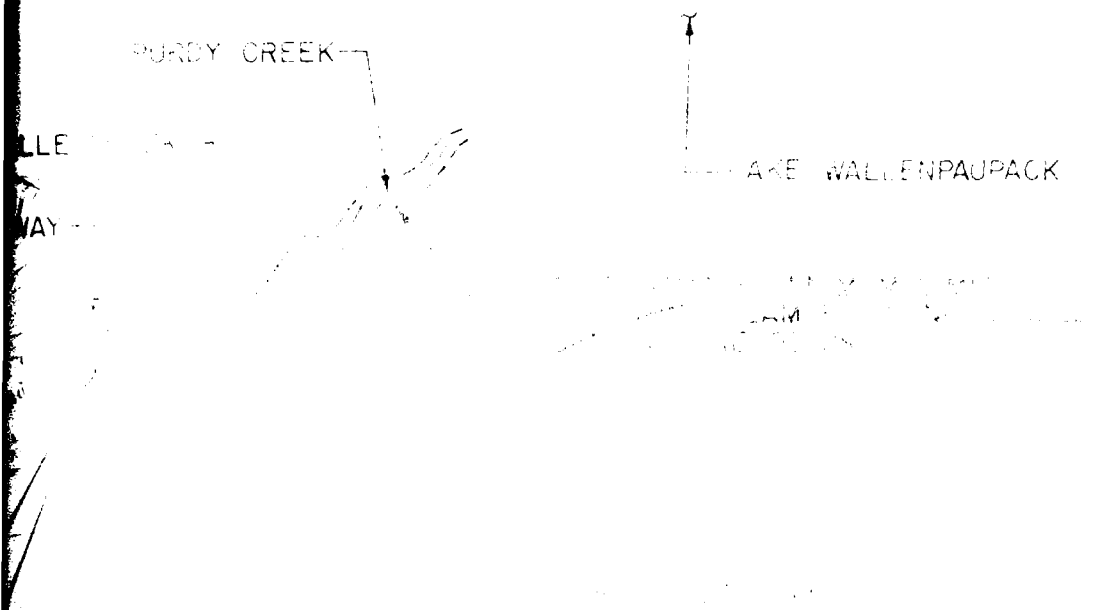
PURD

AKE

EK

2000 0 2000

SCALE: 1 IN. = 2000 FT.



NOTES:

1. LIMITS OF DOWNSTREAM FLOODING ARE ESTIMATES BASED ON VISUAL OBSERVATIONS.
2. CIRCLED NUMBERS INDICATE STATIONS USED IN COMPUTER ANALYSIS.
3. THIS MAP SHOULD NOT BE USED IN CONNECTION WITH THE EMERGENCY OPERATION AND WARNING PLAN

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LOCKLIN POND DAM

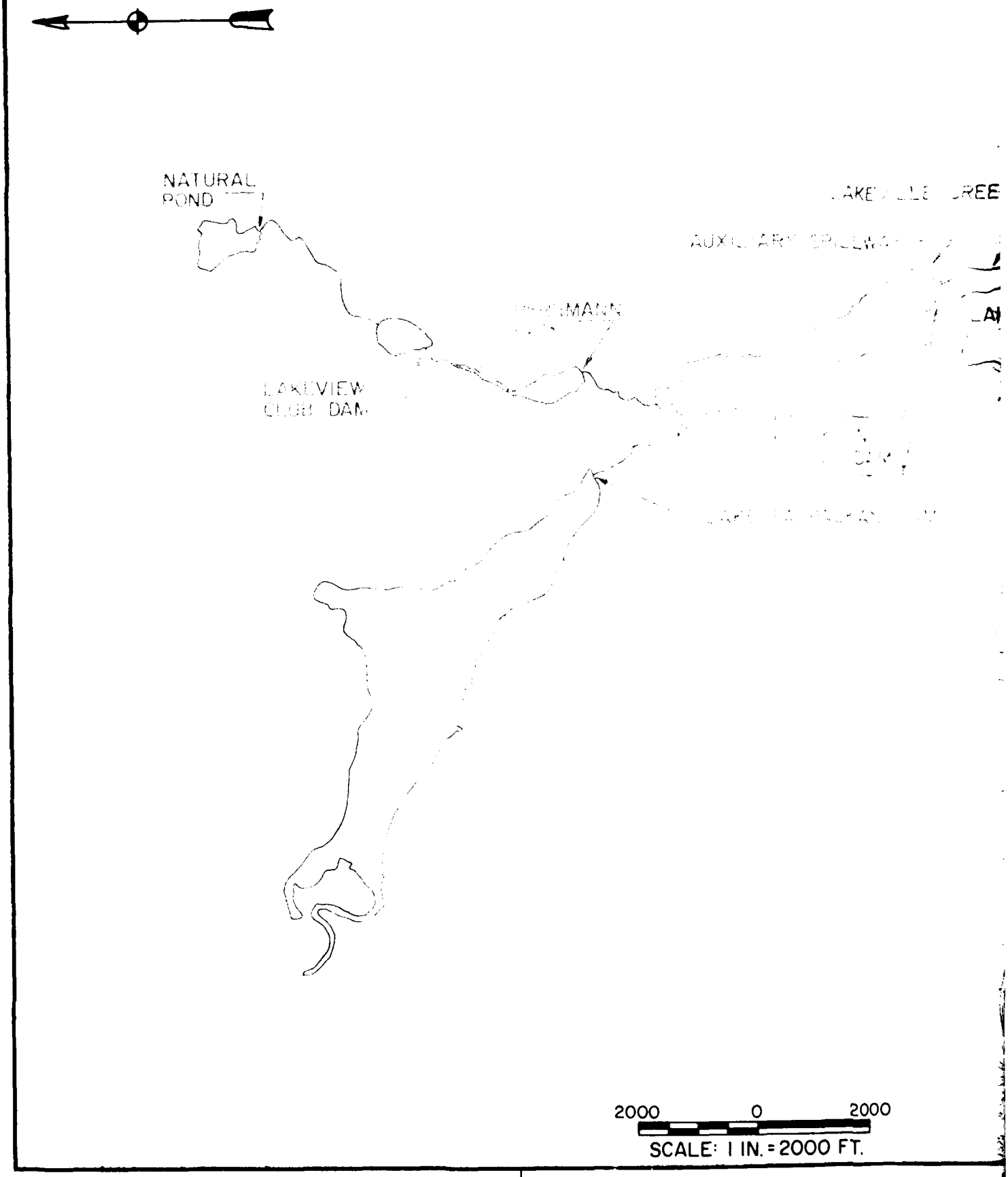
CLIFTON AND LEWIS LOCKLIN

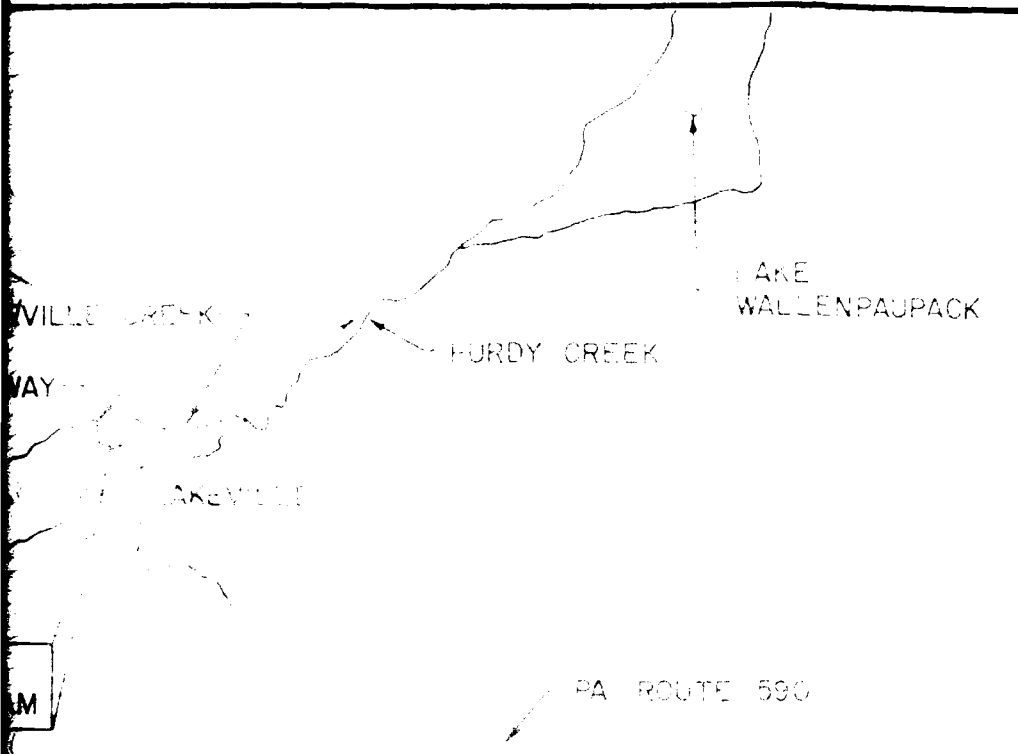
DOWNSTREAM DEVELOPMENT MAP

JULY 1980 EXHIBIT D-1

APPENDIX E

PLATES


NATURAL
POND
LAKEVIEW
2000
0
2000
SCALE: 1 IN. = 2000 FT.



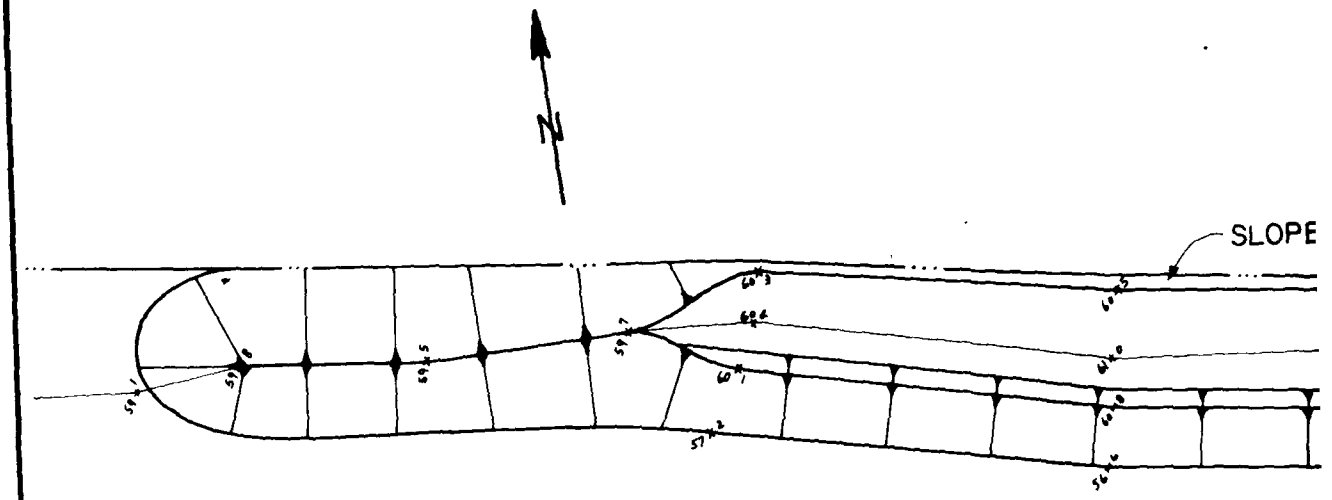
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LOCKLIN POND DAM

CLIFTON AND LEWIS LOCKLIN

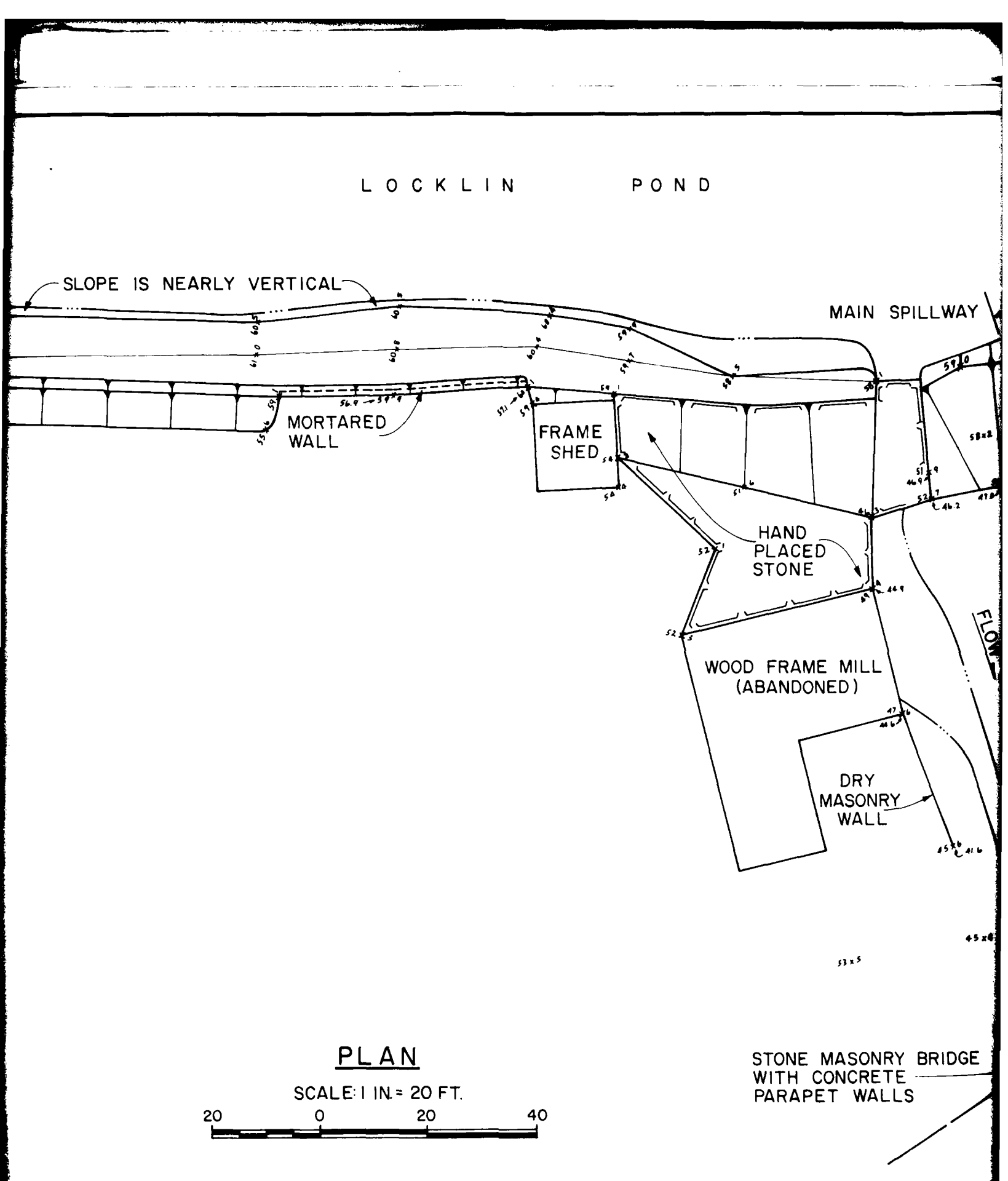
LOCATION MAP

JULY 1980 PLATE E-1



NOTE:

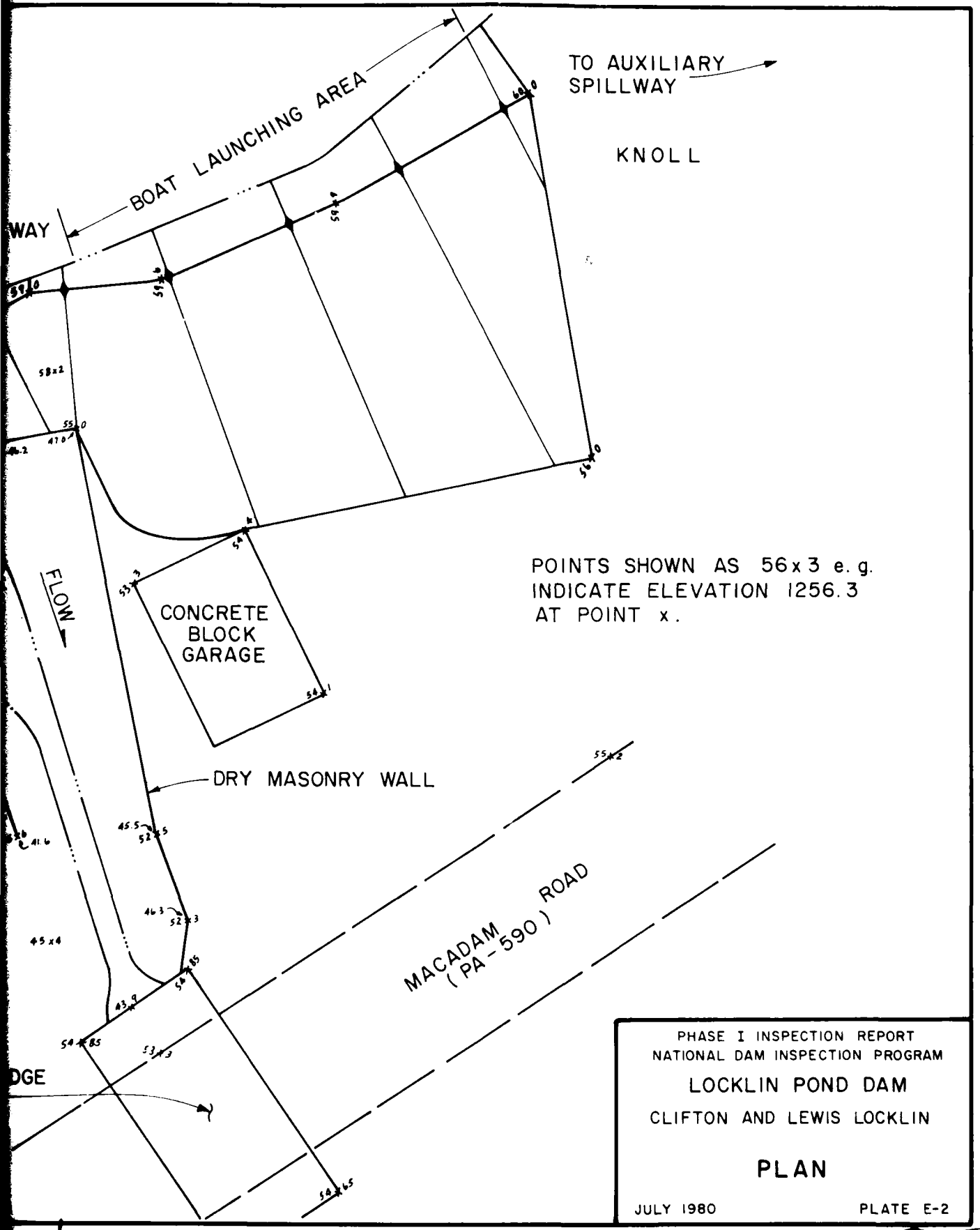
THIS PLAN WAS DRAWN FROM LIMITED SURVEY DATA OBTAINED FOR THIS INSPECTION. IT SHOULD NOT BE CONSIDERED DEFINITIVE.



PLAN

SCALE: 1 IN. = 20 FT.

20 0 20 40



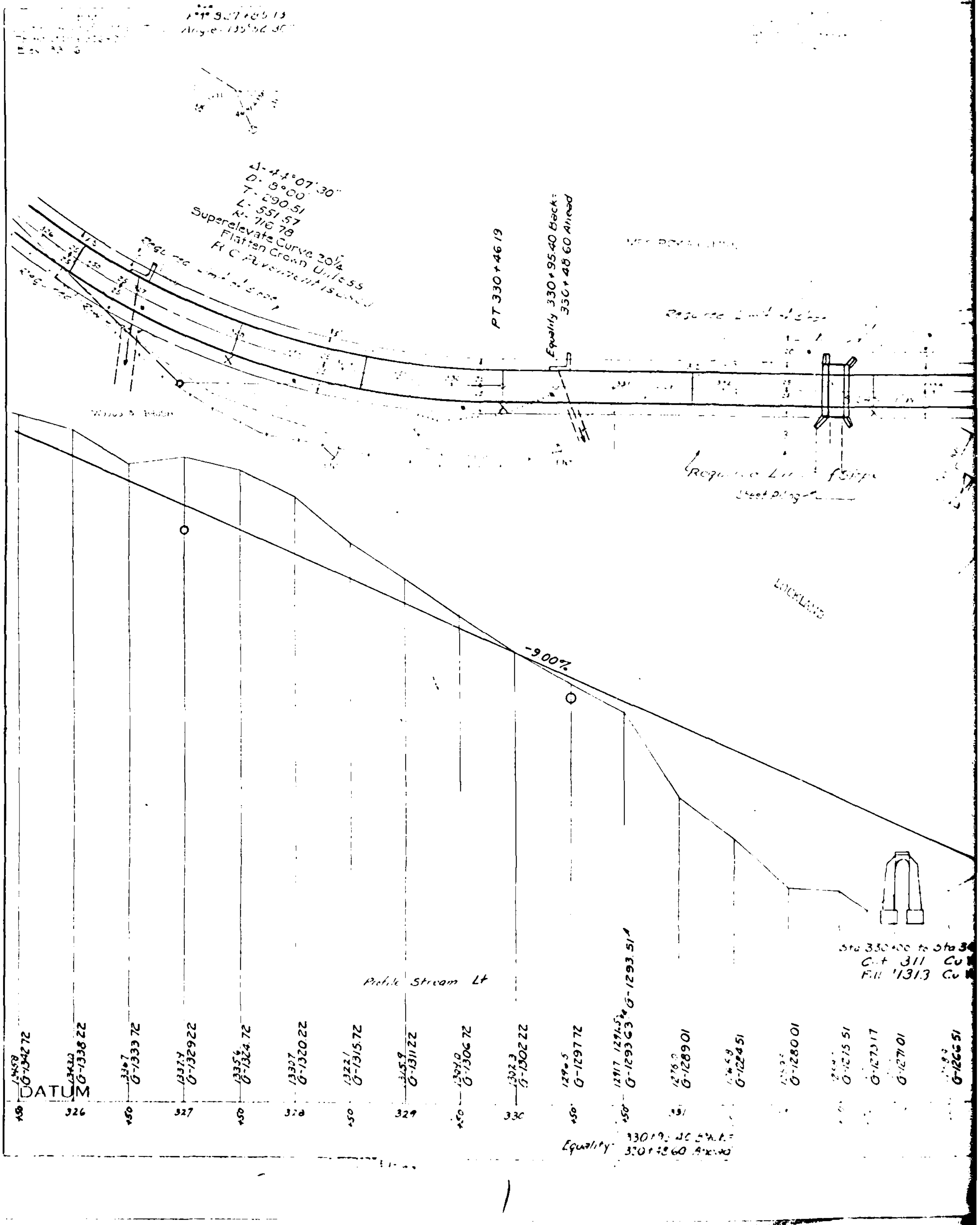
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

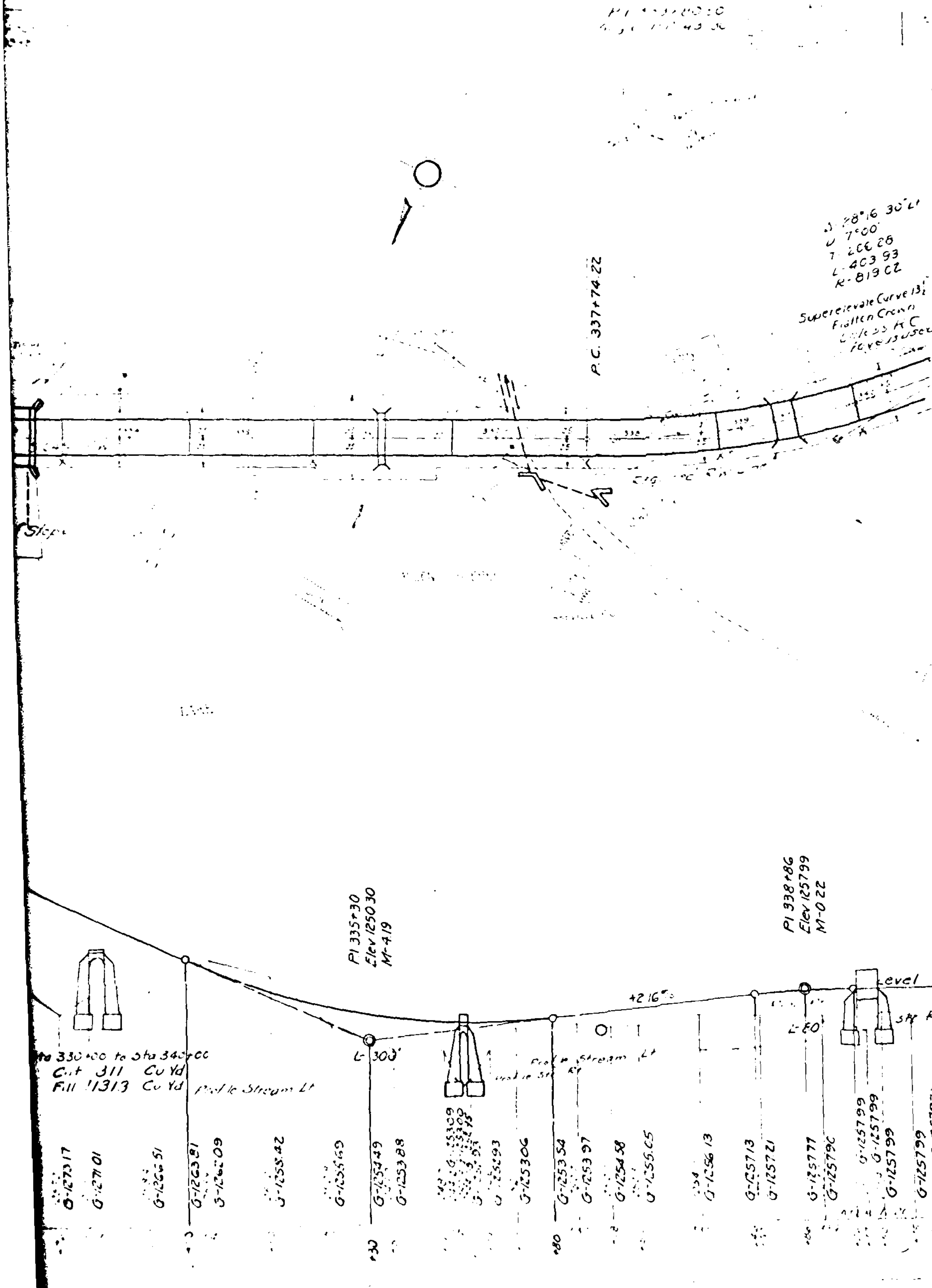
LOCKLIN POND DAM

CLIFTON AND LEWIS LOCKLIN

PLAN

JULY 1980 PLATE E-2


Δ- 44°07'30"
D- 8°00'
T- 290.51
L- 551.57
R- 716.78
Superelevate Curve 20¼
Flatten Crown Unless
P.C. Pavement is used
PT 330+46.19
Equality 330+95.40 Back
330+48.60 Ahead
-9.00%
Profile Stream Lt
Sta 330+00 to Sta 34
Cut 311 Cu
Fill 1313 Cu
DATUM
Equality 330+95.40 Back
330+48.60 Ahead
G-1342.72
G-1338.22
G-1333.72
G-1329.22
G-1324.72
G-1320.22
G-1315.72
G-1311.22
G-1306.72
G-1302.22
G-1297.72
G-1293.63
G-1293.51
G-1289.01
G-1284.51
G-1280.01
G-1275.51
G-1271.01
G-1266.51
326
327
328
329
330
331
+50



REQUIRE[illegible] LIST

Sta 330+50
50-15" C.M.P.
1-E Ew Lt
5 C.Y. Ditch Ex

Sta 331+00
25 C.Y. Fill Rd Appr Lt
15 Rt

Sta 337+00
20 C.Y. Fill Rd Appr Lt

Sta 337+20
50-15" C.M.P.
1-E Ew Rt
5 C.Y. Ditch Ex

Sta 337+40
[illegible] C.Y. Fill Rd App Rt

Sta 337+50
60-15" C.M.P. Across [illegible]
1-E Ew
5 C.Y. Ditch Ex

Sta 333+08
Cement Rubble Masonry Arch
with [illegible] Spillway
[illegible]
27 C.Y. Class "B" Conc
138 C.Y. Grouted Rubble [illegible]
323 C.Y. Cement Rubble Masonry
[illegible] Wakefield Steel Piling
550 C.Y. Class I Excavation
35 C.Y. Class I Excav Channel
105 C.Y. Class 2 Excav Arch
SK-217 6-2-31
Sta 336+07 SK-217 [illegible]
Cement Rubble Masonry Arch
[illegible]
195 C.Y. Cement Rubble Masonry
30 C.Y. Class I Excav Channel
175 C.Y. Class II Excav Arch
28 C.Y. Class "B" Conc
Sta 339+37
Std. Reinf. Conc. Bridge
Span 8', Nom. & Act. Clear 5',
Skew 90°, Clear Roadway 23'
33.8 C.Y. Class "A" Conc.
44.? C.Y. Class "B" Conc.
3813 Lbs. Plain Steel Bars
39.67 S.Y. Bridge Floor Pave.
20 C.Y. Class I Excav Channel
95 C.Y. Class 2 Excav Arch
S-193, 2-21-31; S-180 12-23-30.
11 C.Y. Stone Backfill
*812# Plain Steel Bars for Approaches

*The embankment between Sta 330+00 and Sta 334+00 shall be spread and rolled in layers one-half (1/2) the specified depth in accordance with paragraph 90 of the specifications.

*Not applicable unless R.C. Pavement is used.

[illegible] to be removed by the County [illegible]

THIS [illegible]
FROM [illegible]

P[illegible]
NATI[illegible]
L[illegible]
CLIF[illegible]
JULY [illegible]

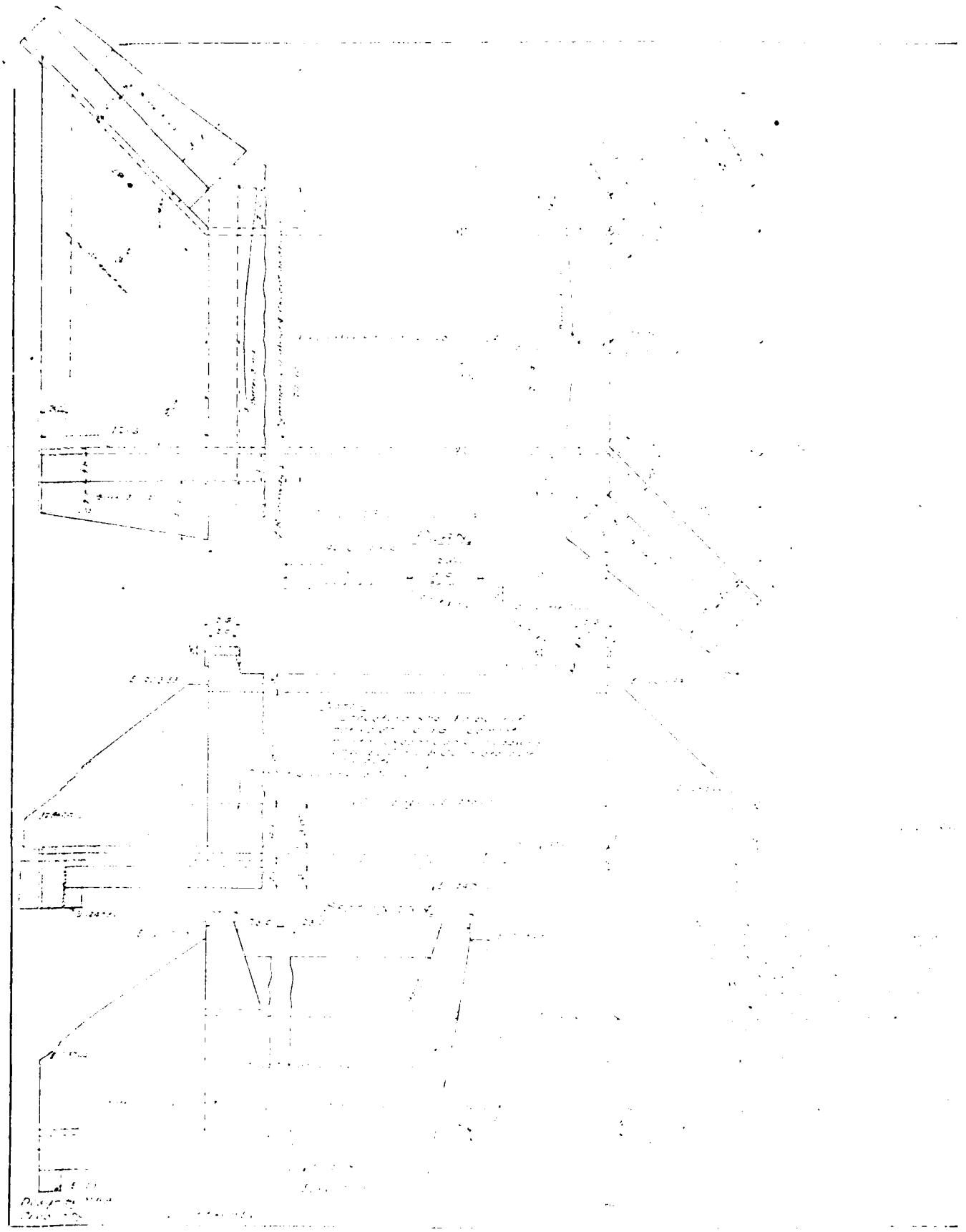
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

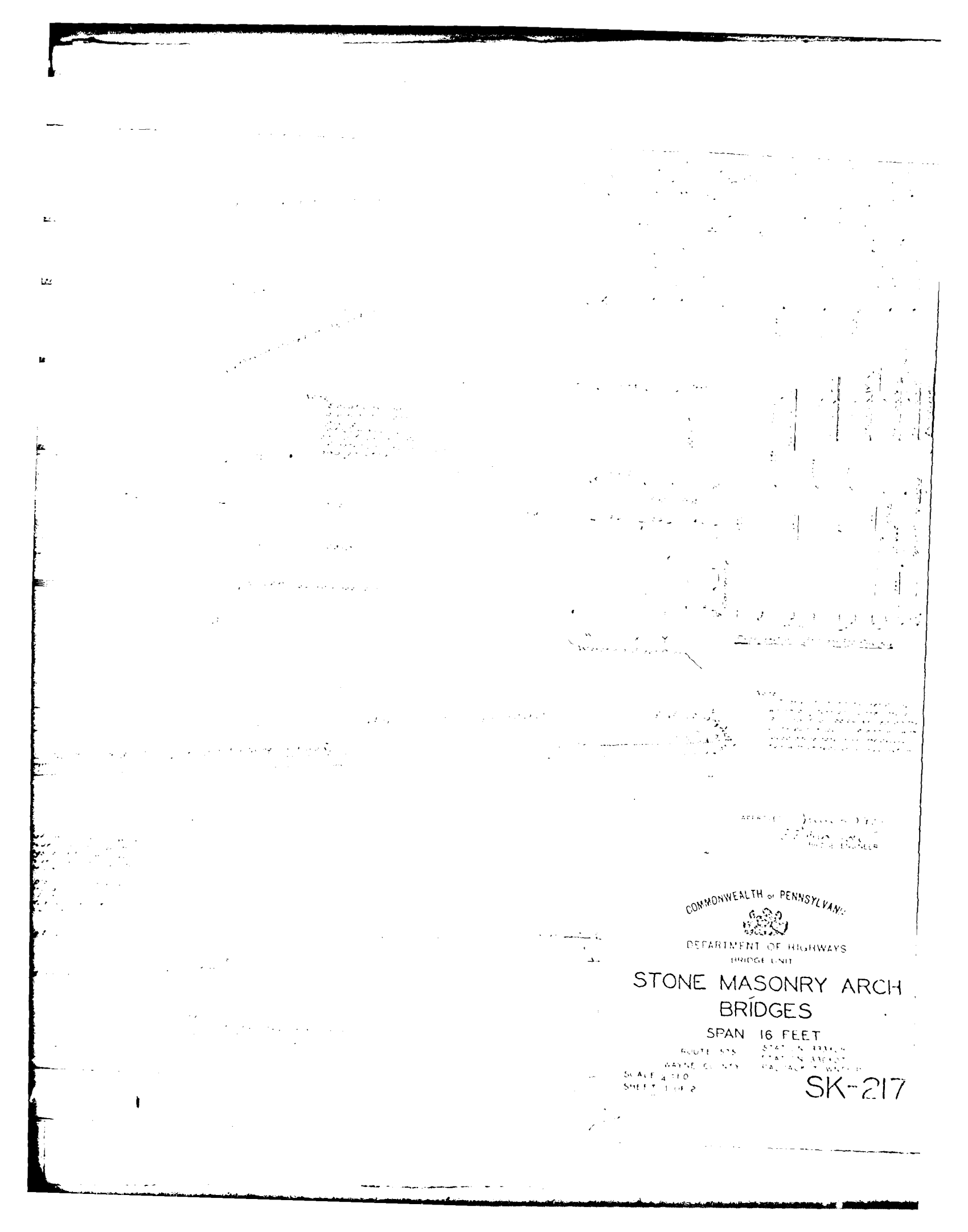
LOCKLIN POND DAM

CLIFTON AND LEWIS LOCKLIN

PLAN OF ROAD

JULY 1980 PLATE 1 3





COMMONWEALTH of PENNSYLVANIA

DEPARTMENT OF HIGHWAYS

BRIDGE UNIT

STONE MASONRY ARCH BRIDGES

SPAN 16 FEET

ROUTE 535 STATION

WAYNE COUNTY

SCALE 1" = 1'-0"

SHEET 1 OF 2

SK-217

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

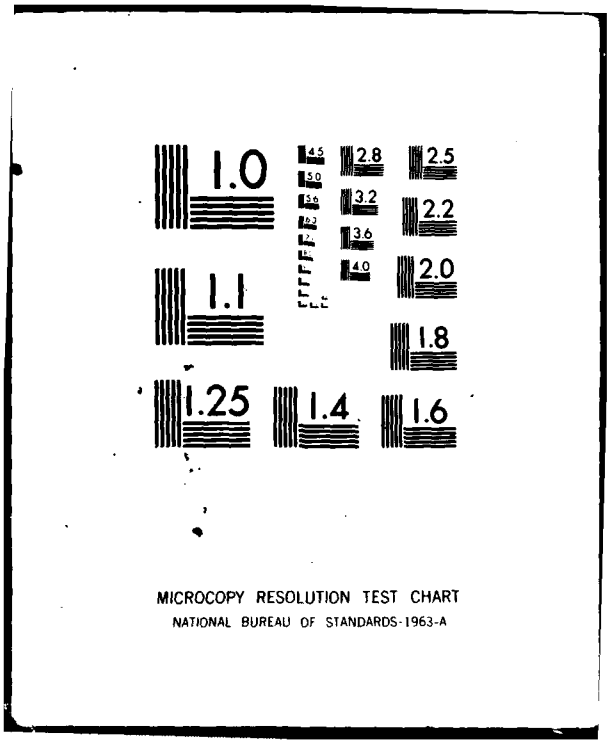
LOCKLIN POND DAM

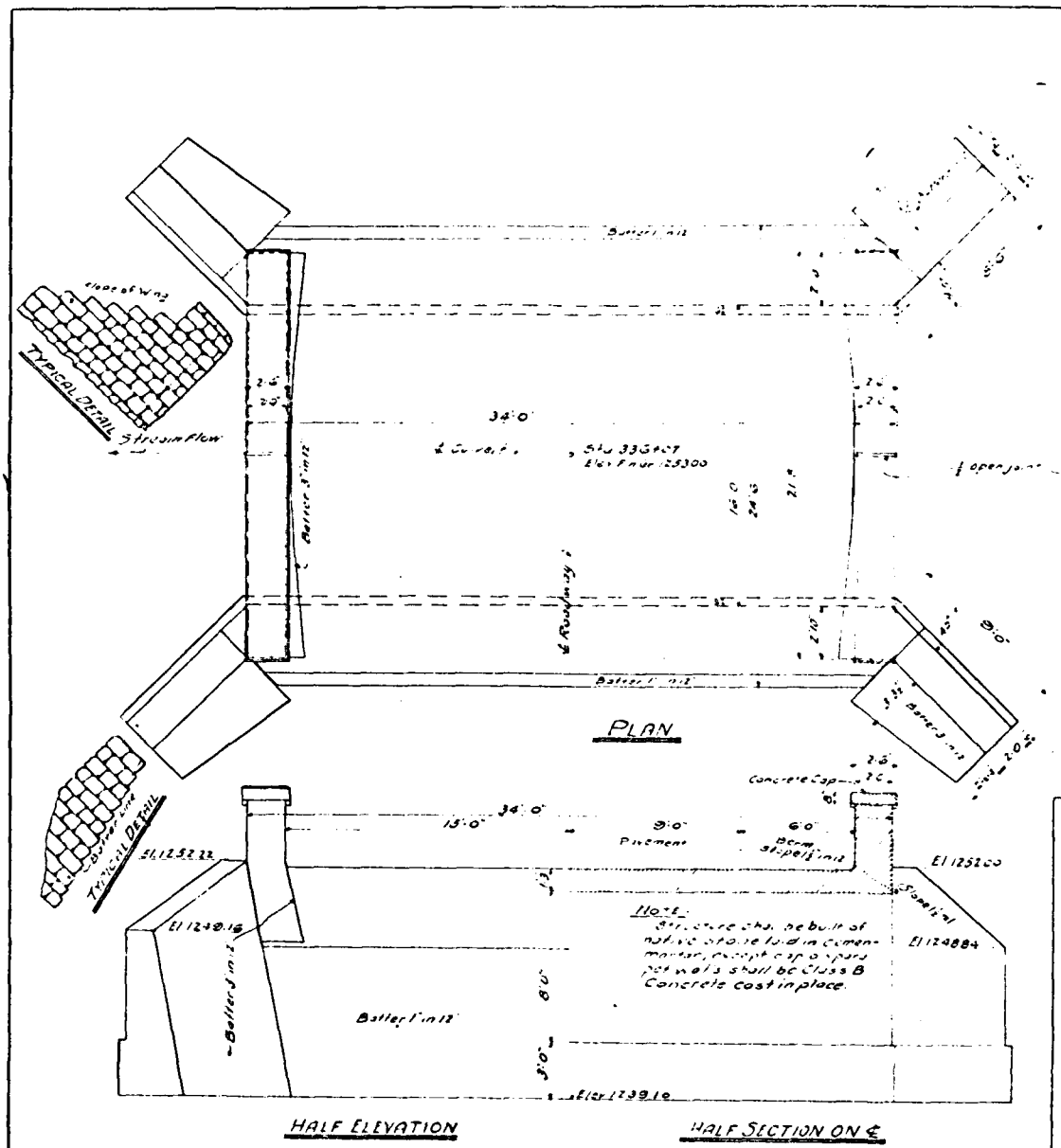
CLIFTON AND LEWIS LOCKLIN

AUXILIARY SPILLWAY

JULY 1980 PLATE E-4

AD-A091 148 GANNETT FLEMING CORDDRY AND CARPENTER INC HARRISBURG PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. LOCKLIN POND DAM (NDI ID NUMBE--ETC(U)
JUL 80 DACW31-80-C-0017
UNCLASSIFIED NL


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



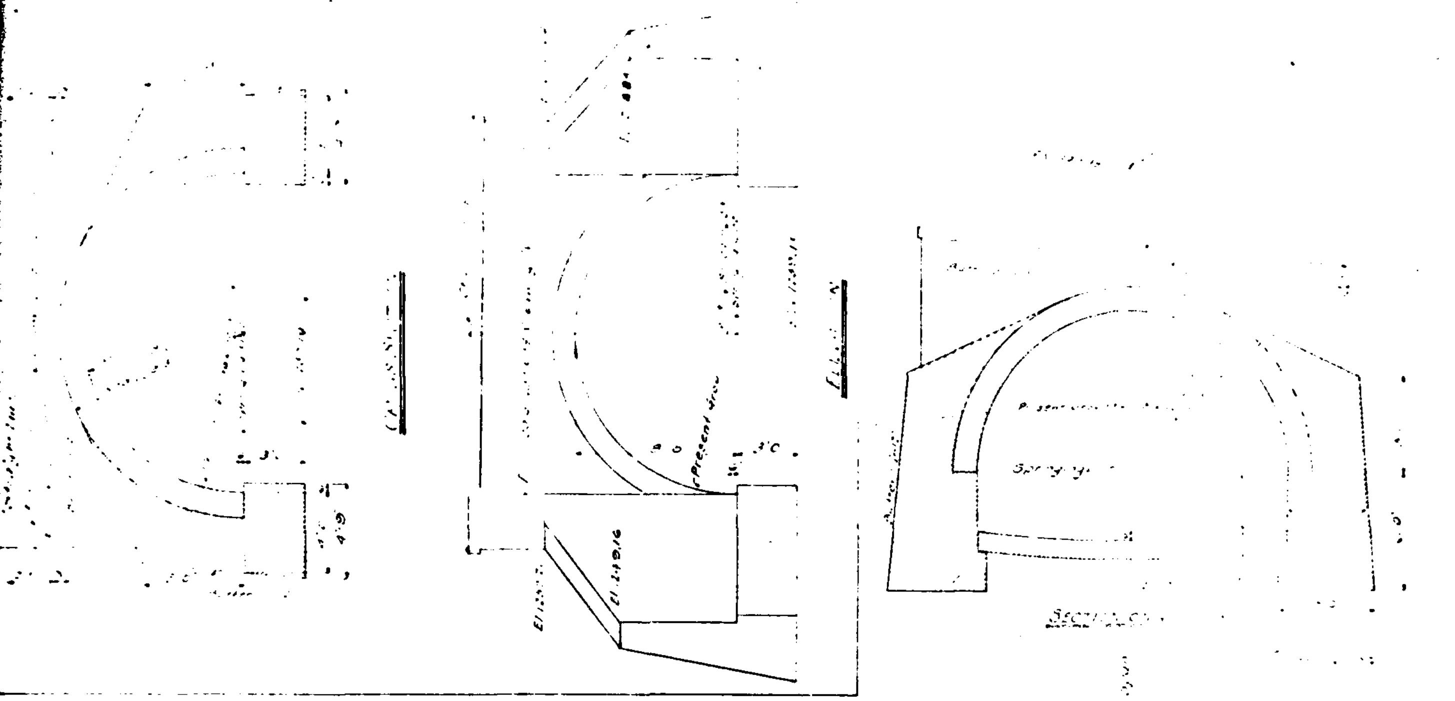
QUANTITIES (Sta 333+08)

550 Cu yds Class 1 Excavation
108 Cu yds Class 2 Excavation
323 Cu yds Cement Rubble Stone Masonry
2.7 Cu yds Class B Concrete.
138 Cu yds Grouted Rubble Stream Bed Paving
184 Pcs Wakefield Sheet Piles, 10'-0" long

QUANTITIES (Sta 336+07)

175 Cu yds Class 2 Excavation.
195 Cu yd. Cement Rubble Stone Masonry.
2.8 Cu yds Class B Concrete.

Design by MAB
Checked by WBH 6231 Quantities REV



Piles.

Material

[illegible] Douglas Fir or White Oak [illegible] thickness of 2 and surfaces [illegible]

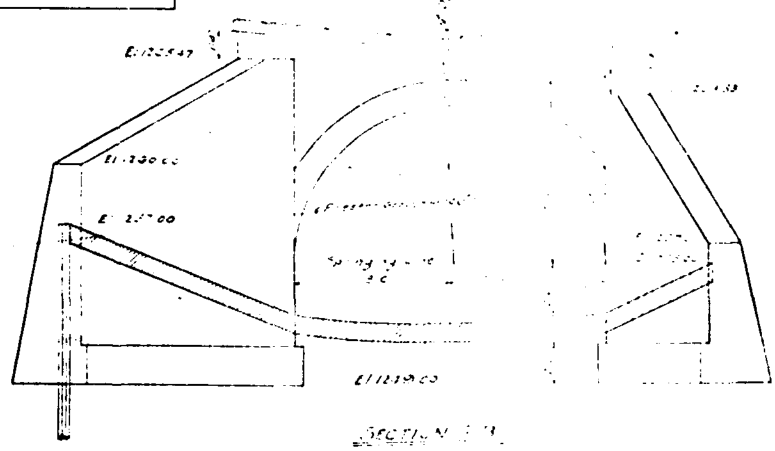
Spikes [illegible] be [illegible] length for the point [illegible] after driving to permit clinching.

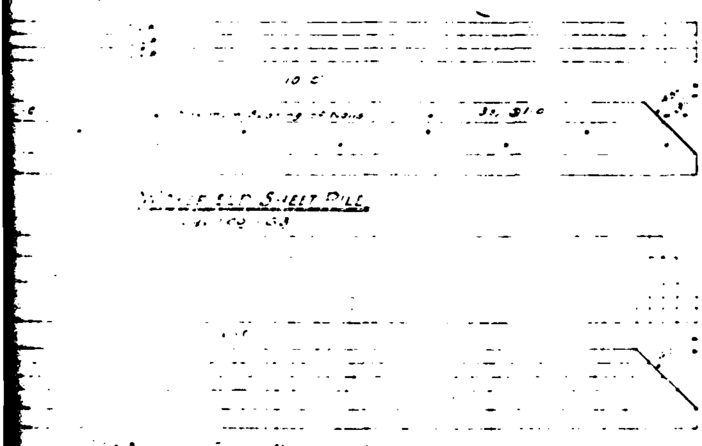
Construction

[illegible] be built up of three planks spiked together [illegible] middle plank offset to form a [illegible] tongue on one side and [illegible] groove on the other side.

[illegible] be staggered and shall not be spaced [illegible] apart than [illegible] center to center for a distance of 3 [illegible] from either end of the pile. One half of the spikes shall be driven from one side of the pile and the other half from the opposite side. All spikes shall be clinched.

The bottom of each pile shall be cut off at an angle of [illegible] as shown in the detail.





Commonwealth of Pennsylvania

Department of Highways

Stone [illegible] Arch

Route 575

Wayne County

Scales 1/4" & 1"=1'-0"

Sheet 2 of 2

Approved [signature]

Bridge Engineer

217

2

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LOCKLIN POND DAM

CLIFFORD AND LEWIS LOCKLIN

BRIDGE DETAILS

JULY 1980 PLATE E-5

APPENDIX F

GEOLOGY

LOCKLIN POND DAM

APPENDIX F

GEOLOGY

Locklin Pond Dam is located in Wayne County within the Appalachian Plateau Physiographic Province. The most pronounced topographic feature in the area is Camelback Mountain, which is part of the Pocono Plateau Escarpment. The escarpment has a well-defined southwestward trend from Camelback Mountain, but is irregular between Camelback Mountain and Mt. Pocono, which lies to the north. Streams east of the escarpment drain directly to the Delaware River, while those to the west drain to the Lehigh River.

The Pocono Plateau Section lies to the west of the escarpment. This area is relatively flat, with local relief seldom exceeding 100 feet. The topography has been greatly influenced by continental glaciation. Many features were created by deposition of glacial materials. The entire plateau lacks well-developed drainage.

East of the escarpment is the Glaciated Low Plateaus Section of the province. This area is characterized by pre-glacial erosional topography with locally-thick glacial deposits. Local relief is generally 100 to 300 feet.

Bedrock units of the sections described above are the lithified sediments of offshore marine, marginal marine, deltaic environments and fluvial environments associated with the Devonian Period. These units include siltstones of the Mahantango Formation, siltstones and shales of the Trimmers Rock Formation, and seven mapped members of the Catskill Formation. These members include sandstones, siltstones, and shales of the Towamensing member; sandstone, siltstone and shale of the Walcksville Member; sandstones, siltstones and shale of the Beaverdam Run Member; sandstone and shale in the Long Run Member; sandstones and conglomerates in the Packerton Member; sandstones and some conglomerates in the Poplar Gap Member; and sandstones and conglomerates in the Duncannon Member.

Locklin Pond Dam is underlain by the Poplar Gap Member of the Catskill Formation. The Poplar Gap Member is predominantly a gray sandstone and conglomeratic

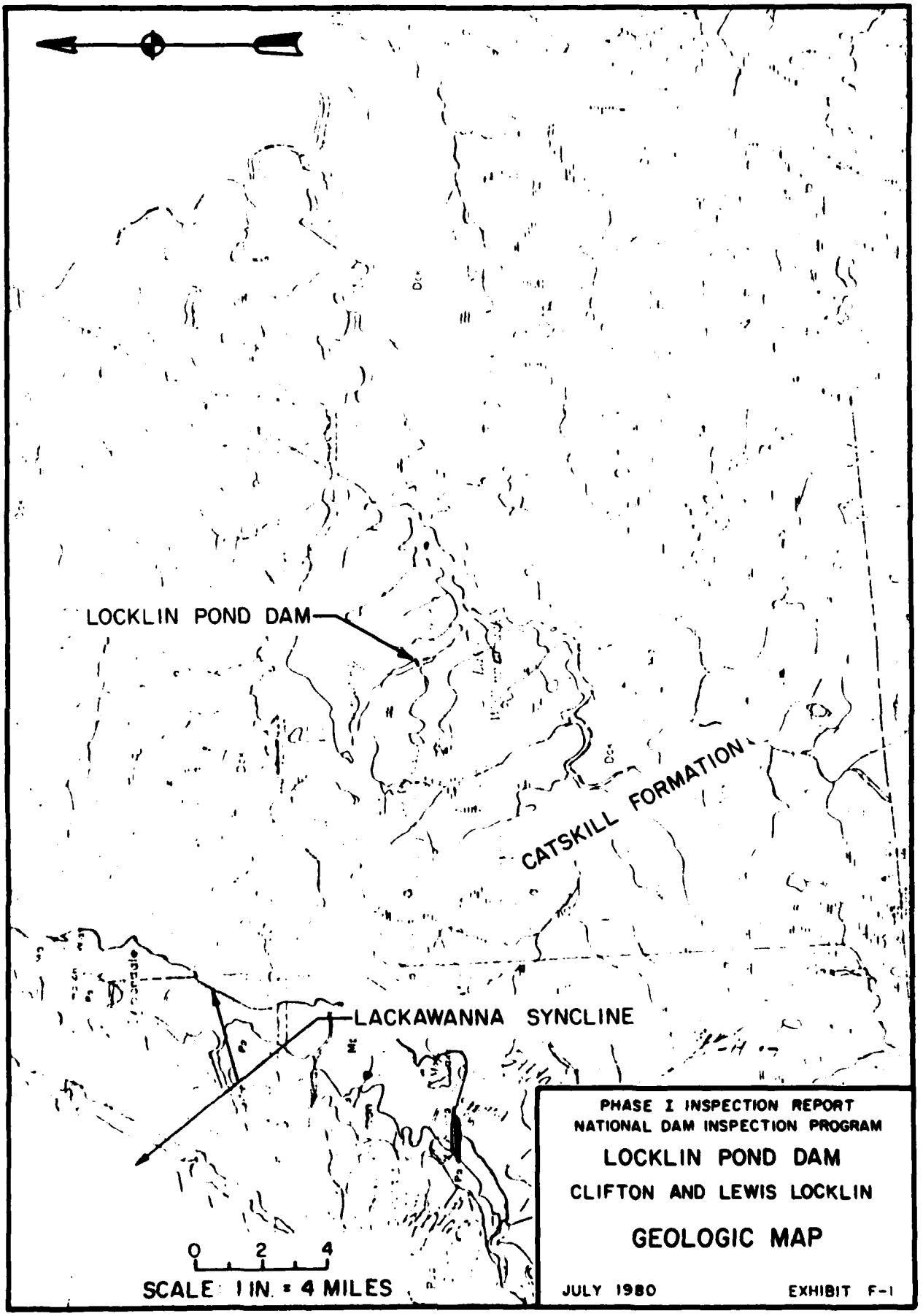
sandstone with interbedded siltstones and shales. Sandstones present are thick-bedded, fine-to coarse-grained and exhibit very low primary porosity due to a clay and silica matrix. Effective porosity results from fractures and parting planes.

Conglomeratic sandstone occurs primarily as concentrates of sub-round to round quartz pebbles. The siltstones and shales at the site are thin-bedded and also have low porosity.

The rocks are well-indurated and generally are not susceptible to slope failure; however, the presence of well-developed bedding and joint planes will result in some rockfall from vertical and high-angle cut slopes.

Bedrock is entirely overlain by glacial till of Late Wisconsin Age. This till is an unsorted mixture of clay, silt, sand, and gravel. It is moderately cohesive and is generally derived locally from the sandstones of the Catskill Formation. Thickness of the till varies from 5 to 75 feet.

The actual foundation conditions at the dam are unknown. No bedrock is visible adjacent to Locklin Pond Dam.



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LOCKLIN POND DAM

CLIFTON AND LEWIS LOCKLIN

GEOLOGIC MAP

JULY 1980 EXHIBIT F-1


ILMED